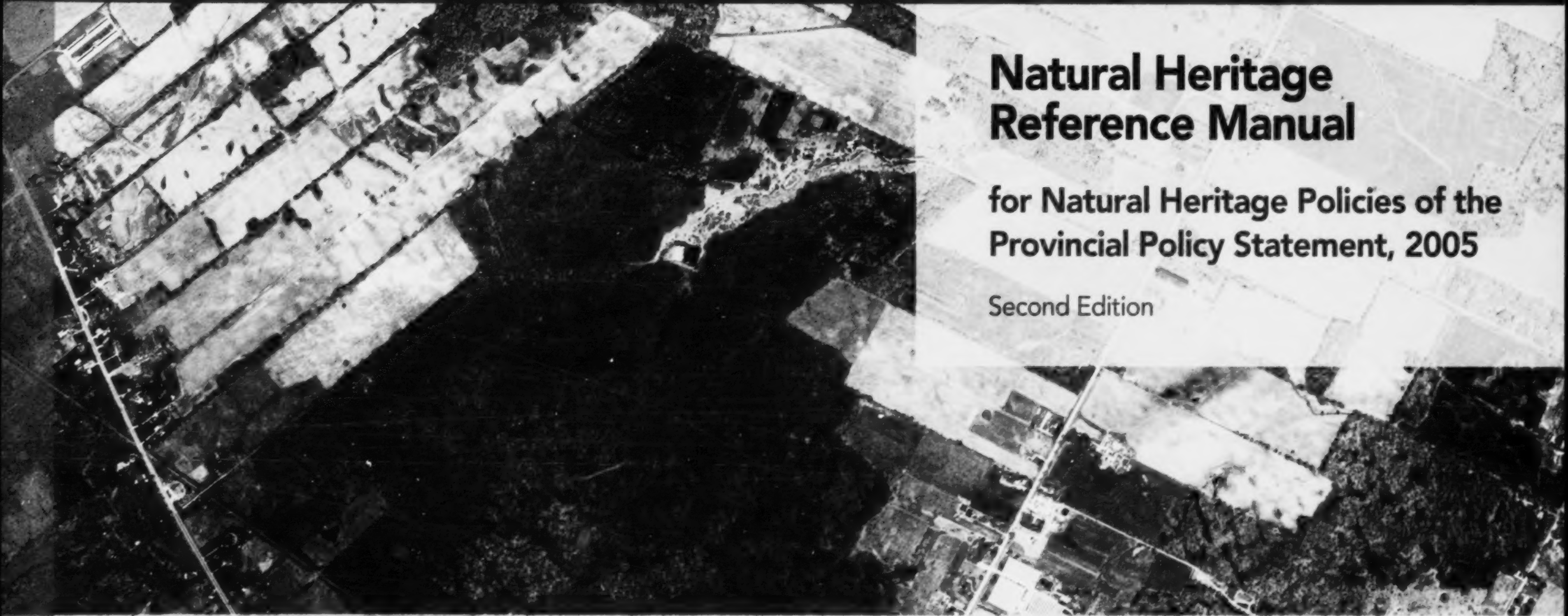
Ministry of Natural Resources

Ontario

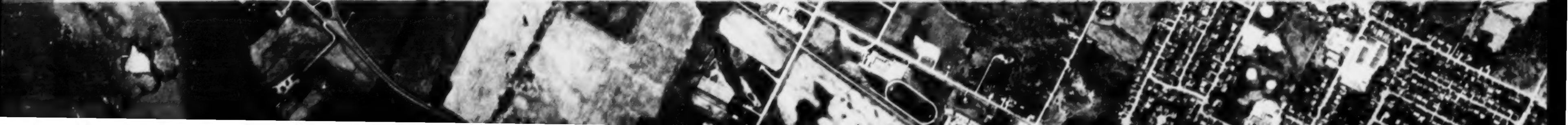
Natural. Valued. Protected.



Natural Heritage Reference Manual

for Natural Heritage Policies of the Provincial Policy Statement, 2005

Second Edition



Natural Heritage Reference Manual
for Natural Heritage Policies of the Provincial Policy Statement, 2005

Ontario Ministry of Natural Resources

Second Edition
March 18, 2010

MNR Number 52630 (English)
2 k P.R., 10 03 26

ISBN 978-1-4435-1790-4 (Print) • ISBN 978-1-4435-1791-1 (PDF)
ISBN 978-1-4435-1793-5 (PDF résumé en français)

© 2010, Queen's Printer for Ontario
Printed in Ontario, Canada

This publication is available at: http://www.mnr.gov.on.ca/289522.pdf

How to cite this manual:

Ontario Ministry of Natural Resources. March 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Toronto: Queen's Printer for Ontario. 248 pp.

Cette publication hautement specialisée (Natural Heritage Reference Manual pour la politique 2.1 de la déclaration de principes provinciale [2005] résumé en français de la deuxième édition) n'est disponible qu'en anglais en vertu du Règlement 411/97 qui en exempte l'application de la Loi sur les services en français. Résumé en français est disponible à http://www.mnr.gov.on.ca/289523.pdf • MNR Number 52630-1

Editor: Sarah Weber • Design and layout: Brian Dench • Cover photo credits: Wasyl Bakowsky, Scott Bishop and Rick Stankiewicz

FSC
Mixed Sources
Product group from well-managed forests, controlled sources and recycled wood or fiber
www.fsc.org Cert no. SW-COC-001506
© 1996 Forest Stewardship Council
30%

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

TABLE OF CONTENTS

ACKNOWLEDGEMENTS x

ABBREVIATIONS USED IN THIS MANUAL xi

1.0 INTRODUCTION 1
- 1.1 Purpose and Scope 1
  - 1.1.1 Intended Audience for the Manual 1
  - 1.1.2 Regional Variations in Planning Issues and Planning Resources 2
  - 1.1.3 Implications for Resource Management of Natural Heritage Features and Areas 2
- 1.2 Manual Implementation 2
  - 1.2.1 The Need for Early Consultation 3
- 1.3 How to Use the Manual 3
  - 1.3.1 Manual Organization 3

2.0 PROVINCIAL POLICY STATEMENT IMPLEMENTATION 6
- 2.1 Natural Heritage Policies 6
- 2.2 Protection of Natural Features and Areas for the Long Term 8
- 2.3 Applying Other PPS Policies 8
  - 2.3.1 Water 9
  - 2.3.2 Agricultural Uses 9
  - 2.3.3 Mineral Aggregate Resources 11
- 2.4 Going Beyond the PPS 11
- 2.5 Official Plans 12
- 2.6 Provincial Plans 13

3.0 NATURAL HERITAGE SYSTEMS 15
- 3.1 General Concepts of Natural Heritage Systems 15
- 3.2 Policy Explanation 15
  - 3.2.1 Coordinated, Integrated and Comprehensive Approaches 17
- 3.3 Why Protect? 18

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table of Contents *(continued from previous page)*

3.4 Identification 21
3.4.1 Landscape Context General Characteristics 21
3.4.2 Natural Heritage System Components 22
3.4.3 Considering Ecological Functions and Promoting Ecological Integrity 27
3.4.4 Building on Existing Natural Heritage System Work 33
3.4.5 Natural Heritage Systems in Agricultural Areas 34
3.4.6 Natural Heritage Systems in Settlement Areas 34

4.0 NATURAL HERITAGE FEATURES AND AREAS 37
4.1 Introduction 37
4.2 The Meaning of "Significant" 38
4.2.1 Identification and Evaluation of Significant Features and Areas 39
4.3 The Importance of Regional and Local Natural Heritage Features 40
4.4 Adjacent Lands 41
4.4.1 Provincial Recommendations for the Extent of Adjacent Lands 41
4.4.2 Developing Municipal Approaches for Determining the Extent of Adjacent Lands 43
4.5 Relationship between Adjacent Lands and Buffers 44
4.6 Area-Specific Policy 45
4.6.1 Canadian Shield Line 45
4.6.2 Ecoregion Line 46

5.0 SIGNIFICANT HABITAT OF ENDANGERED AND THREATENED SPECIES 47
5.1 Policy Explanation 47
5.1.1 Relationship to the Endangered Species Act, 2007 48
5.2 Why Protect? 49
5.3 Identification 49
5.3.1 Process for Delineating Significant Habitat When Detailed Information Is Unavailable 50
5.4 Adjacent Lands 55

(continued on next page)

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table of Contents *(continued from previous page)*

6.0 SIGNIFICANT WETLANDS AND SIGNIFICANT COASTAL WETLANDS 56
- 6.1 Policy Explanation 56
  - 6.1.1 Peat Extraction 57
  - 6.1.2 Relationship to PPS Water Policies 58
  - 6.1.3 Relationship to the Conservation Authorities Act 58
- 6.2 Why Protect? 58
- 6.3 Identification 60
  - 6.3.1 Significant Wetlands 60
  - 6.3.2 Significant Coastal Wetlands 61
  - 6.3.3 Wetland Complexes 61
- 6.4 Adjacent Lands 61

7.0 SIGNIFICANT WOODLANDS 63
- 7.1 Policy Explanation 63
  - 7.1.1 Relationship to the Forestry Act and Forest Conservation By-Laws 64
- 7.2 Why Protect? 64
- 7.3 Identification 66
  - 7.3.1 Recommended Evaluation Criteria for Determining Significant Woodlands 67
  - 7.3.2 Delineation of Woodland Patches 72
- 7.4 Adjacent Lands 73

8.0 SIGNIFICANT VALLEYLANDS 74
- 8.1 Policy Explanation 74
  - 8.1.1 Relationship to the Conservation Authorities Act 75
- 8.2 Why Protect? 75
- 8.3 Identification 76
  - 8.3.1 Recommended Evaluation Criteria for Determining Significant Valleylands 76
  - 8.3.2 Cultural Heritage Resources 80
- 8.4 Adjacent Lands 80

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table of Contents *(continued from previous page)*

9.0 SIGNIFICANT WILDLIFE HABITAT ... 81
- 9.1 Policy Explanation ... 81
- 9.2 Why Protect? ... 82
- 9.3 Identification ... 82
  - 9.3.1 Significant Wildlife Habitat Technical Guide ... 83
  - 9.3.2 Process for Identifying and Confirming Significant Wildlife Habitat ... 84
- 9.4 Adjacent Lands ... 89

10.0 SIGNIFICANT AREAS OF NATURAL AND SCIENTIFIC INTEREST ... 90
- 10.1 Policy Explanation ... 90
- 10.2 Why Protect? ... 91
- 10.3 Identification ... 91
  - 10.3.1 Life Science and Earth Science Frameworks ... 91
- 10.4 Adjacent Lands ... 93

11.0 FISH HABITAT ... 94
- 11.1 Policy Explanation ... 94
  - 11.1.1 Relationship to the Fisheries Act ... 95
- 11.2 Why Protect? ... 95
- 11.3 Identification ... 96
  - 11.3.1 Broadscale Fish Habitat Features and Characteristics ... 97
  - 11.3.2 Detailed Fish Habitat Features and Characteristics ... 100
  - 11.3.3 Fish Habitat Classification ... 102
  - 11.3.4 Fish Species at Risk ... 102
- 11.4 Adjacent Lands ... 103
  - 11.4.1 Riparian Areas ... 105

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table of Contents *(continued from previous page)*

12.0 HOW TO PROTECT: MUNICIPAL PLANNING TECHNIQUES AND TOOLS 107
- 12.1 Introduction 107
- 12.2 Early Consultation 107
- 12.3 Official Plans 108
  - 12.3.1 Goals and Objectives 108
  - 12.3.2 Identification and Protection 108
  - 12.3.3 Assessing Land Use Changes 111
  - 12.3.4 Implementation Considerations for Natural Heritage Systems 111
- 12.4 Zoning By-Laws 113
  - 12.4.1 Natural Heritage Systems Zoning 113
  - 12.4.2 Natural Heritage Features and Areas Zoning 114
  - 12.4.3 Zone Standards 115
- 12.5 Site Development Controls 116
  - 12.5.1 Site Plan Control 116
  - 12.5.2 Development Permit System 116
- 12.6 Subdivision of Land 116
- 12.7 Tree Conservation, Site Alteration and Other Municipal By-Laws 117
- 12.8 Conservation Approaches Beyond Land Use Planning 117

13.0 ADDRESSING IMPACTS OF DEVELOPMENT AND SITE ALTERATION 118
- 13.1 Introduction 118
- 13.2 Determining Negative Impacts 119
- 13.3 Determining Whether Assessment Is Required 119
- 13.4 Determining an Appropriate Level of Assessment 121
- 13.5 Impact Assessment Process 122
  - 13.5.1 Early Consultation 122
  - 13.5.2 Contents of an Environmental Impact Study 123
  - 13.5.3 Identifying Monitoring Needs 128
  - 13.5.4 Approaches to Mitigation 129
  - 13.5.5 Review of Assessment 132
  - 13.5.6 Planning Authority Decision 132

(continued on next page)

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table of Contents *(continued from previous page)*

14.0 PERFORMANCE INDICATORS 133

15.0 PROVINCIAL LAND USE PLANNING DOCUMENTS 134

16.0 ANNOTATED BIBLIOGRAPHY: ADJACENT LANDS AND BUFFERS RESEARCH 136

APPENDIX A: NATURAL HERITAGE SYSTEM PLANNING 145
- A.1 Natural Heritage Systems Planning Evolution 145
- A.2 Considering Ecological Importance and Promoting Ecological Integrity 145
  - A.2.1 Representation/Distribution 145
  - A.2.2 Patch Attributes 146
  - A.2.3 Linkage/Corridor Attributes 148
- A.3 Checklist – Planning for a Natural Heritage System 153
- A.4 Comprehensive Approach to Planning for a Natural Heritage System 158
  - A.4.1 Principle of Collaboration 158
  - A.4.2 Natural Heritage System Process Steps 158

APPENDIX B: NATURAL HERITAGE INFORMATION SOURCES 166
- B.1 Natural Heritage Information Sources Overview 166
  - B.1.1 Information Sources Summary by PPS Natural Heritage Policy Area 169
  - B.1.2 Information Source Descriptions and Directions on Use 171

APPENDIX C: ADDRESSING IMPACTS OF DEVELOPMENT ON NATURAL HERITAGE FEATURES 188
- C.1 Potential Development Impacts and Mitigation 188
  - C.1.1 Examples of Potential Development Impacts and Mitigation 188
  - C.1.2 Applying Buffers 204
- C.2 Site-Specific Assessment Planning Tools 207
  - C.2.1 Describing the Environment for Site-Specific Assessment 207
  - C.2.2 Sample Checklist for Use in Assessing Impacts of Development 214

APPENDIX D: GLOSSARY OF TERMS 216

WORKS CITED 219

ADDITIONAL READING 227

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table of Contents *(continued from previous page)*

LIST OF FIGURES

Figure 2-1: Provincial Plans 13
Figure 3-1: Example of an Isolated Natural Feature with Lower Ecological Functioning 18
Figure 3-2: Natural Areas Supporting Core and Linkage Functions 26
Figure 3-3: Considering Natural Heritage System Ecological Functioning and Integrity 30
  A. Example Landscape for Considering Ecological Functioning and Integrity 30
  B. Identifying Interior Habitat for Considering Ecological Functioning and Integrity 31
  C. Preferred Patch Attributes for Considering Ecological Functioning and Integrity 32
  D. Less Preferred Patch Attributes for Considering Ecological Functioning and Integrity 33
Figure 4-1: Example of Tailoring an Adjacent Lands Study 44
Figure 4-2: Illustration of the Relationship between Adjacent Lands and Buffers 45
Figure 4-3: Area-Specific PPS Natural Heritage Policy – Canadian Shield and Ecoregion Line 46
Figure 5-1: Process for Identifying Significant Habitat of Endangered and Threatened Species 51
Figure 9-1: Process for Identifying and Confirming Significant Wildlife Habitat 85
Figure 11-1: Broadscale Potential Fish Habitat Examples 99
Figure 11-2: Measuring Adjacent Lands – Lakes and Large Rivers 104
Figure 11-3: Measuring Adjacent Lands – Meandering Stream with Defined Bed and Banks 104
Figure 11-4: Measuring Adjacent Lands – Non-meandering Stream with Defined Bed and Banks 104
Figure 13-1: Process for and Relationship between Impact Assessment Components 120
Figure A-1: Process for a Coordinated, Integrated and Comprehensive Approach for Natural Heritage Systems 159

(continued on next page)

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table of Contents *(continued from previous page)*

LIST OF TABLES

Table 1-1: Manual Topic Descriptions with Section and Appendix Location 4
Table 3-1: Planning Concerns and Potential Benefits of Natural Heritage Systems 19
Table 3-2: Natural Heritage System Core Area Attributes 23
Table 3-3: Natural Heritage System Linkage Attributes 25
Table 3-4: Ecological Function Measures of Natural Features and Areas for a Natural Heritage System 28
Table 4-1: Where Authority Rests for Establishing the Significance of Features for the PPS 39
Table 4-2: Provincial Recommendations for Adjacent Lands Widths for PPS Policy 2.1.6 42
Table 7-1: PPS-Identified Woodland Benefits and Description 65
Table 7-2: Recommended Significant Woodland Evaluation Criteria and Standards 68
Table 8-1: Recommended Significant Valleylands Evaluation Criteria and Standards 77
Table 11-1: Recommendations for How to Measure Adjacent Lands Width for Fish Habitat 103
Table 11-2: Fish Habitat Concerns Relevant to Adjacent Lands 105
Table 11-3: Recommended Minimum Natural Vegetated Cover Adjacent to Fish Habitat 106
Table 12-1: Official Plan Approaches for Protecting Natural Heritage Systems, Features and Areas 108
Table 13-1: Function and Benefits of Buffers 130
Table B-1: Applying Information Sources to Support PPS Natural Heritage Policy Areas 166
Table B-2: Summary of PPS Natural Heritage Information Sources 169
Table B-3: Provincial Government Offices/Program Information Sources 171
Table B-4: Conservation Organization Information Sources 175
Table B-5: Manuals/Guidelines Information Sources 177
Table B-6: Internet Information Sources 179
Table B-7: Data Layer Information Sources 180
Table C-1: Summary of Potential Development Activity Impacts and Mitigation 188
Table C-2: PPS Natural Heritage Features and Buffer Descriptions 204
Table C-3: Terrestrial Species Inventory Components 212

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

ACKNOWLEDGEMENTS

This document was prepared by the Ontario government, led by the Ministry of Natural Resources under the guidance of the Natural Heritage Reference Manual Review Team, which consisted of representatives from a wide range of stakeholder groups. The Ministry of Natural Resources greatly appreciates the contributions of these individuals and the organizations they represent. Numerous other individuals and organizations also contributed to the document through the Environmental Registry. In addition, the ministry is grateful for the contributions provided by North-South Environmental Inc., which provided early drafts of the revised manual and contributed assistance and advice throughout the project. The ideas, approaches and information contained in this document, however, are the sole responsibility of the Ministry of Natural Resources and in no way bind or limit the ability of individuals or organizations to express opinions or approaches that differ from those found in this document.

The following ministries, municipalities, conservation authorities and stakeholder groups were consulted during its preparation and/or reviewed drafts of the manual.

Ontario Ministries

- Ministry of Agriculture, Food and Rural Affairs
- Ministry of Culture
- Ministry of Energy and Infrastructure
- (formerly Ministry of Energy and Ministry of Public Infrastructure Renewal)
- Ministry of the Environment
- Ministry of Health Promotion
- Ministry of Municipal Affairs and Housing
- Ministry of Northern Development and Mines
- Ministry of Tourism
- Ministry of Transportation

Municipalities

- Association of Municipalities of Ontario
- City of Greater Sudbury
- City of London
- City of Timmins
- City of Vaughan
- Region of Halton
- Region of Peel
- Simcoe County
- Town of Georgina
- Town of Markham
- York Region

Conservation Authorities

- Credit Valley Conservation
- Grand River Conservation Authority
- Halton Region Conservation Authority
- Lakehead Region Conservation Authority
- Toronto Region Conservation Authority

Non-governmental Organizations

- Building Industry and Land Development Association
- Ontario Federation of Agriculture
- Ontario Nature
- Ontario Professional Planners Institute
- Ontario Stone, Sand & Gravel Association
- University of Waterloo

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

ABBREVIATIONS USED IN THIS MANUAL

ANSI	area of natural and scientific interest
ARA	Aquatic Resource Area
DFO	Fisheries and Oceans Canada
EIS	environmental impact study
ELC	Ecological Land Classification
ESA	Endangered Species Act, 2007
FEC	Forest Ecosystem Classification
FQI	Floristic Quality Index
FRI	Forest Resources Inventory
GIS	geographic information system
GGH Growth Plan	Growth Plan for the Greater Golden Horseshoe
HADD	harmful alteration, disruption or destruction of fish habitat
LIO	Land Information Ontario
MMAH	Ontario Ministry of Municipal Affairs and Housing
MOE	Ontario Ministry of the Environment
MNDM	Ontario Ministry of Northern Development and Mines
MNR	Ontario Ministry of Natural Resources
NGO	non-governmental organization
NHIC	Natural Heritage Information Centre
OBM	Ontario Base Map
OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs
ORMCP	Oak Ridges Moraine Conservation Plan
OWES	Ontario Wetland Evaluation System
PPS	Provincial Policy Statement, 2005
PSW	provincially significant wetland
SARO List	Species at Risk in Ontario List
SOLRIS	Southern Ontario Land Resource Information System

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

1.0 INTRODUCTION

1.1 Purpose and Scope

The second edition of the Natural Heritage Reference Manual (the manual) provides technical guidance for implementing the natural heritage policies of the Provincial Policy Statement, 2005[1] (PPS) (see section 2). The manual represents the Province's recommended technical criteria and approaches for being consistent with the PPS in protecting natural heritage features and areas[2] and natural heritage systems in Ontario.

While the manual provides information and approaches to assist in implementing PPS policy, it does not add to or detract from the policy. Additional ways to achieve the desired outcomes required by the PPS may exist, but if approaches other than those recommended in this manual are used, the onus is on the proponent of those approaches to demonstrate that they are consistent with the PPS.

It is important to stress that the recommendations in the manual are triggered only when there is a requirement to be consistent with the PPS, as provided in Subsection 3(5) and 3(6) of the Planning Act.[3] Further consideration must be given to the PPS definitions for "development" and "site alteration" (see section 2.1).

The PPS shall be read in its entirety and all relevant policies are to be applied to each situation.

This manual does not contain all the information needed to undertake the detailed technical studies that may be required for natural heritage planning. It does, however, indicate sources for additional technical information and expertise that may be obtained for project pre-consultation or for the information collection component of technical studies. In addition, the manual provides examples of approaches that planning authorities have used in dealing with natural heritage planning matters.

The manual has been developed in consultation with practitioners and provides the most up-to-date information available at the date of publication on specific technical issues relating to the natural heritage policies of the PPS. To keep the manual current, it may be further updated as science information and technology or techniques improve.

1.1.1 Intended Audience for the Manual

The manual is a reference tool for municipalities, planning boards and other approval authorities, all of which are referred to as "planning authorities" from this point forward. Landowners, developers, conservation authorities, commissions, environmental agencies, community-based organizations, non-governmental organizations (NGOs) and the public also play important roles in planning and will want to consult the manual when seeking to implement PPS natural heritage policies.

The manual should be consulted by people involved in:

- the development and review of policy documents;
- the review and approval of development applications; and
- matters before provincial boards and tribunals such as the Ontario Municipal Board.

---

[1] The PPS came into effect on March 1, 2005 and applies to all applications, matters or proceedings commenced on or after this date. Where the 1997 Provincial Policy Statement applies to applications, matters or proceedings prior to the PPS, the Natural Heritage Reference Manual, 1999 should be consulted. However, direction and advice contained in the second edition of the Natural Heritage Reference Manual could be useful since it is the most up-to-date and comprehensive.

[2] The term "natural heritage features and areas" has specific policy direction and definition in the PPS. The manual uses variations of this term in other contexts to denote general conservation biology concepts.

[3] A wide range of legislation and regulations may apply to decisions with respect to Planning Act applications. In some cases, a Planning Act proposal may also require approval under other legislation or regulation.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The manual is designed for use by people who have a basic understanding of the requirements and processes of the Planning Act and the policies of the PPS.[4] In addition, it is assumed that some if not all users of the manual will have an understanding of ecology or a related discipline. It is not the purpose of this manual to provide a basic education in ecology or conservation biology, or to provide the technical expertise for undertaking all the analyses required to satisfy the PPS.

Natural heritage planning and planning for other provincial interests can be a community-based activity involving residents, landowners, NGOs, community groups (e.g., naturalist clubs) and local environmental agencies (e.g., conservation authorities). These groups, as well as the Province (e.g., Ministry of Natural Resources [MNR] district offices, Ministry of Municipal Affairs and Housing [MMAH] municipal services offices, and other ministries), can all work cooperatively with the planning authority and its expert advisors on natural heritage to identify and protect natural heritage systems, features and areas.

1.1.2 Regional Variations in Planning Issues and Planning Resources

It is recognized that planning authorities face various planning conditions across the province. Examples of these variations include:

- total population;
- population growth rate; and
- amount of landscape covered by woodlands, wetlands and other natural features.

It also is recognized that some planning authorities may have limited planning resources. Nevertheless, the manual is intended to provide guidance that is adaptable to all communities in Ontario regardless of location. Planning authorities may adopt other approaches relevant to the local situation provided that they can be demonstrated to achieve or exceed the same objectives as those in the PPS.

1.1.3 Implications for Resource Management of Natural Heritage Features and Areas

The manual is not intended to apply directly to resource management of natural heritage features or areas, since such activities do not normally require Planning Act approvals and are often related to maintenance or improvement of natural heritage features or areas. The manual does not preclude the active management of natural heritage features and areas or any other conservation initiatives that are consistent with the intent of the natural heritage policies of the PPS.

1.2 Manual Implementation

Within the manual, the Province has provided updated recommendations and guidance for the PPS natural heritage policies (based on new policy direction in the PPS and latest scientific information). The recommended technical criteria and approaches should be considered for land use planning and the review of development applications under the Planning Act.

Where these recommendations represent changes to criteria (e.g., adjacent lands widths) from the 1999 Natural Heritage Reference Manual and would require updating an official plan or zoning by-law for implementation, planning authorities may make that transition as part of their next review of the planning document (see section 2.5). Despite any differences between the manual versions, planning authorities still must make decisions on planning matters that are consistent with the PPS as per section 3(5) of the Planning Act.

---

[4] The manual may also be useful in considering applications that must fulfill other approval processes (e.g., class environmental assessments).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

1.2.1 The Need for Early Consultation

Early consultation, as discussed in section 12.2, will facilitate the implementation of measures and recommendations contained in the manual. In some situations, for example, where there are significant habitats for species that have different habitat needs, planning authorities should consider establishing a process to bring together appropriate technical experts so that a preferred approach can be developed.

Early consultation by planning authorities is highly recommended to access policy advice through the provincial One Window Planning Service led by MMAH as well as information and technical advice directly from MNR. Where MNR information and technical advice are needed, for example to support municipal plan review, planning authorities should consult with their local MNR district office (see appendix B).

Early consultation with planning authorities on the part of proponents can assist in identifying any agencies or organizations with regulatory requirements that affect the protection of natural heritage features and areas. The Niagara Escarpment Commission[5] and conservation authorities[6] are examples of such agencies and organizations. Planning authorities and development proponents should contact relevant agencies and organizations to determine any approval or permit requirements under their respective legislation.

As part of the development of early consultation and public involvement strategies, it is desirable to consider strategies for effective involvement of Aboriginal communities (if applicable). Furthermore, Ontario is committed to meeting any constitutional and legal obligations that it has with respect to existing Aboriginal and treaty rights.

1.3 How to Use the Manual

When using the manual, all users should refer to the PPS and other relevant provincial plans and policies. To ensure a full understanding of PPS natural heritage policies, planning authorities should become familiar with and make use of the entire manual as part of long-range planning and reviewing of development applications. Developers and their consultants, however, may choose to refer to relevant individual sections of the manual for a particular application or to seek guidance for addressing impacts.

1.3.1 Manual Organization

Although the entire manual should be consulted for complete comprehension, individual sections have been designed as stand-alone pieces to assist users when only needing to reference specific natural heritage policies or topics. To support this, the manual is organized by specific natural heritage policies or topics, with the basic guidance material in the main sections and more technical material in the appendices. Table 1-1 provides a summary of the manual's organization.

---

[5] For more information on the Niagara Escarpment Commission, see MNR's website at http://www.mnr.gov.on.ca/en/Business/LUEPS/2ColumnSubPage/STEL02_165805.html.

[6] For more information on conservation authorities, see MNR's website at http://www.mnr.gov.on.ca/en/Business/Water/2ColumnSubPage/STEL02_163413.html.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 1-1: Manual Topic Descriptions with Section and Appendix Location

TOPIC	DESCRIPTION	SECTION	APPENDICES
Introduction	• presents the purpose and scope of the manual	1	N/A
PPS implementation	• details natural heritage PPS policies • provides direction on applying other PPS policies and going beyond the PPS • discusses the relationship of the PPS and official plans and provincial plans	2	N/A
Natural heritage systems	• presents a recommended natural heritage systems approach for planning authorities to use for protecting natural features and implementing the PPS as per policy 2.1.2	3, 12.3.4 12.4.1	A.1–A.4
Natural heritage features and areas introduction	• discusses the meaning and relevance of "significant" and "adjacent lands" for identified features • provides direction on the relationship between adjacent lands and buffers	4	N/A
Significant habitat of endangered and threatened species	• describes each of the natural heritage features and areas identified in PPS policies 2.1.3, 2.1.4 and 2.1.5 • explains policy • gives reasons for protection • describes identification and evaluation procedures • discusses adjacent lands widths	5	N/A
Significant wetlands and significant coastal wetlands		6	N/A
Significant woodlands		7	N/A
Significant valleylands		8	N/A
Significant wildlife habitat		9	N/A
Significant areas of natural and scientific interest		10	N/A
Fish habitat		11	N/A

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 1-1 *(continued from previous page)*

TOPIC	DESCRIPTION	SECTION	APPENDICES
How to protect	• discusses municipal planning techniques and other tools (e.g., zoning by-laws, conservation easements) that planning authorities should consider when establishing protection approaches for natural heritage systems and natural heritage features and areas	12	N/A
Addressing impacts of development and site alteration	• provides guidance for assessing potential impacts of development and site alteration on natural heritage features, areas and adjacent lands • provides guidance on carrying out an environmental impact study (EIS) process	13	C.1–C.2
Performance indicators	• provides general information on performance indicators	14	N/A
Provincial land use planning documents	• provides list of supporting provincial land use planning documents	15	N/A
Annotated bibliography	• provides summaries of published literature relating to ecological functions of adjacent lands and the associated recommendations in the manual	16	N/A
Information sources for identification and evaluation of natural heritage	• provides list and direction on use of provincial information sources for identifying and evaluating PPS natural heritage policy areas	N/A	B.1
Works cited	• lists supporting scientific sources	end of manual	N/A
Additional reading	• lists sources for additional reading	end of manual	N/A

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

2.0 PROVINCIAL POLICY STATEMENT IMPLEMENTATION

The PPS provides policy direction on matters of provincial interest related to land use planning under the Planning Act. The PPS states, "In respect of the exercise of any authority that affects a planning matter, Section 3 of the Planning Act requires that decisions affecting planning matters 'shall be consistent with' policy statements issued under the Act."

2.1 Natural Heritage Policies

As stated previously, the manual represents the Province's recommended approach to implementing natural heritage policies under policy 2.1 of the PPS (see below for specific policies and supporting definitions[7]) and the natural heritage aspects of other PPS policies (e.g., policies 1.2.1 and 2.2). To be consistent with the PPS, planning authorities or applicants need to follow the recommended approaches in the manual or, if using other approaches, demonstrate how they are consistent with the PPS.

2.1 NATURAL HERITAGE

2.1.1 Natural features and areas shall be protected for the long term.

2.1.2 The diversity and connectivity of natural features in an area, and the long-term *ecological function* and biodiversity of *natural heritage systems*, should be maintained, restored or, where possible, improved, recognizing linkages between and among *natural heritage features and areas*, *surface water features* and *ground water features*.

2.1.3 *Development* and *site alteration* shall not be permitted in:

a) *significant* habitat of *endangered species* and *threatened species*;
b) *significant wetlands* in Ecoregions 5E, 6E and 7E; and
c) *significant coastal wetlands*.

2.1.4 *Development* and *site alteration* shall not be permitted in:

a) *significant wetlands* in the Canadian Shield north of Ecoregions 5E, 6E, and 7E;
b) *significant woodlands* south and east of the Canadian Shield;
c) *significant valleylands* south and east of the Canadian Shield;
d) *significant wildlife habitat*; and
e) *significant areas of natural and scientific interest*

unless it has been demonstrated that there will be no *negative impacts* on the natural features or their *ecological functions*.

2.1.5 *Development* and *site alteration* shall not be permitted in *fish habitat* except in accordance with *provincial and federal requirements*.

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

[7] Ecoregions 5E, 6E, 7E and areas south and east of the Canadian Shield are shown in figure 4-3.

(continued from previous page)

2.1.6 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4, and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions.*

2.1.7 Nothing in policy 2.1 is intended to limit the ability of existing agricultural uses to continue.

Provincial Policy Statement 2005, policy 2.1
Italics indicate terms further defined in the PPS

Development: means the creation of a new lot, a change in land use, or the construction of buildings and structures, requiring approval under the Planning Act, but does not include:

a) activities that create or maintain *infrastructure* authorized under an environmental assessment process;

b) works subject to the Drainage Act; or

c) for the purposes of policy 2.1.3(b), underground or surface mining of *minerals* or advanced exploration on mining lands in *significant areas of mineral potential* in Ecoregion 5E, where advanced exploration has the same meaning as under the Mining Act. Instead, those matters shall be subject to policy 2.1.4(a).

Site alteration: means activities, such as grading, excavation and the placement of fill that would change the landform and natural vegetative characteristics of a site.

For the purposes of policy 2.1.3(b), *site alteration* does not include underground or surface mining of *minerals* or advanced exploration on mining lands in *significant areas of mineral potential* in Ecoregion 5E, where advanced exploration has the same meaning as in the Mining Act. Instead, those matters shall be subject to policy 2.1.4(a).

Ecological function: means the natural processes, products or services that living and non-living environments provide or perform within or between species, ecosystems and landscapes. These may include biological, physical and socio-economic interactions.

Negative impacts: means …

b) in regard to *fish habitat*, the harmful alteration, disruption or destruction of *fish habitat*, except where, in conjunction with the appropriate authorities, it has been authorized under the Fisheries Act, using the guiding principle of no net loss of productive capacity; and

c) in regard to other *natural heritage features and areas*, degradation that threatens the health and integrity of the natural features or *ecological functions* for which an area is identified due to single, multiple or successive *development or site alteration* activities.

Provincial Policy Statement 2005, Section 6.0 Definitions
Italics indicate terms further defined in the PPS

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

2.2 Protection of Natural Features and Areas for the Long Term

> Natural features and areas shall be protected for the long term.
>
> **Provincial Policy Statement 2005, policy 2.1.1**

Planning for the protection of natural heritage features and areas for the long term is a fundamental natural heritage policy of the PPS.[8] Additional PPS policies give further direction on achieving the long term protection of natural heritage features and areas and their ecological functions.

The manual contains considerations and recommendations for making informed and responsible decisions, reflecting provincial interests that include the protection of ecological systems, the conservation and management of natural resources and the promotion of development that is designed to be sustainable. To protect the ecological function and biodiversity of natural heritage systems and the health and integrity of natural heritage features or their associated ecological functions for the long term, planning authorities should apply decision-making approaches that incorporate the precautionary approach where appropriate.

2.3 Applying Other PPS Policies

The manual is one of a number of documents the Province has issued to assist planning authorities and other participants in the land use planning system. Users of the manual are reminded that they should read the PPS in its entirety, apply all relevant policies in each situation and fully understand other PPS section policies when applying natural heritage policies. Thus, it is recommended that users of this manual review other relevant support documents that the responsible ministries have developed. Further explanation on how to integrate the consideration of natural heritage policies of the PPS with those for water, agriculture and mineral aggregate resources is provided below, because each is a resource interest typically pertinent in the same general area.

---

[8] Policy 2.1.1 needs to be considered with other PPS policies to ensure planning that decisions are consistent with the entire PPS (see section 2.3).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

2.3.1 Water

> Planning authorities shall protect, improve or restore the *quality and quantity of water* by: …
>
> c) identifying *surface water features, ground water features, hydrologic functions* and *natural heritage features and areas* which are necessary for the ecological and hydrological integrity of the *watershed*; …
>
> e) maintaining linkages and related functions among *surface water features, ground water features, hydrologic functions* and *natural heritage features and areas*; …
>
> **Provincial Policy Statement 2005, policy 2.2.1**
> *Italics indicate terms further defined in the PPS*

Policies 2.1.2 and 2.2 on water, particularly policies 2.2.1(c) and (e) (see above), reflect the interrelated nature of key constituents of ecosystems. Policy 2.2 uses mandatory language about protecting, improving or restoring the quality and quantity of water, and sets out ways that planning authorities are to meet this requirement. Therefore, planning authorities need to consider natural heritage features and areas in terms of their ecological and hydrological importance. As well, there should be consideration of how a natural heritage system (see section 3) will maintain linkages and related functions with the water features and hydrological functions on a watershed basis as identified in the policy.

2.3.2 Agricultural Uses

The Ontario countryside supports both agriculture and natural heritage resources. The distribution of natural heritage features and areas within prime agricultural areas and rural areas ranges from dispersed types, such as woodlots and wetlands within large continuous agricultural areas, to areas with more continuous natural features and areas. It is important for municipal land use planning documents to fully take into account agricultural and natural heritage policy direction set out in the PPS.

The PPS directs that Ontario's prime agricultural areas are to be protected for long-term use for agriculture (policy 2.3), and in prime agricultural areas all types, sizes and intensities of agricultural uses and normal farm practices[9] shall be promoted and protected (policy 2.3.3.2) in accordance with provincial standards. The PPS also directs that locally important agricultural areas in rural areas in municipalities should be designated and protected (policy 1.1.4.1e).

Municipalities need to ensure that agricultural uses, secondary uses and agriculture-related uses are permitted in appropriate locations, consistent with the PPS, when planning for natural heritage systems, features and areas where prime agricultural areas and locally important agricultural areas in rural areas of municipalities have been identified. Appropriate planning for both interests when official plans and zoning by-laws are prepared (see also section 12) will avoid unnecessary future approvals under the Planning Act for new agricultural uses. It should be noted that other regulatory requirements (e.g., Endangered Species Act, conservation authority regulations and development control under the Niagara Escarpment Planning and Development Act) may also exist. These requirements need to be satisfied, where applicable.

---

[9] "Normal farm practices" is defined in the PPS. The case-by-case determination of normal farm practices may occur under the Farming and Food Production Protection Act, 1998, which may take into consideration plans and practices to protect natural heritage, among other things.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Prime agriculture designations limit non-agricultural uses and thus benefit natural heritage protection and other interests. Protecting prime agricultural areas not only supports agriculture and farming (food, fibre and fuel), but also enables Ontario's farms to contribute societal benefits such as clean air, clean water, groundwater recharge, wildlife and wildlife habitats.

Farmers acting as stewards of the land understand the benefits of natural heritage features and areas as demonstrated by initiatives such as implementing environmental farm plans and best management practices. For example, woodlands and hedgerows on farms are often components of farm operations, as they may provide windbreaks and opportunities for maple syrup or firewood production, and help reduce soil erosion. Agricultural best management practices, including planting riparian buffer strips and windbreaks, managing woodlands, crop rotation and conservation tillage, help protect the environment. Many farmers have prepared environmental farm plans, including self-assessment of environmental impacts of their agricultural operation. The environmental farm plan complements land use planning for natural heritage.

Farmers' voluntary stewardship efforts are supported by technical assistance and cost-share funding provided by groups such as stewardship councils; conservation authorities; Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA); Agriculture and Agri-Food Canada; and other agencies;. As a result, farmers will be better able to manage their agricultural operations to protect natural heritage resources.

Planning for agricultural areas and uses does not preclude the need to plan for the long-term protection of natural features and areas. It is a common and often appropriate municipal practice to use an overlay approach in the official plan to identify natural heritage systems (see section 3.4.5), features and areas within Ontario's agricultural system designated as prime agricultural areas. The full range of agricultural permitted uses, as outlined under policy 2.3.3.1 and 2.3.3.2 of the PPS, would be permitted by the prime agriculture designation. With this approach, the natural heritage features and areas shown on the overlay would be considered when a Planning Act application is being considered to re-designate or rezone lands from prime agriculture to a new non-agricultural land use.

For example, the natural heritage overlay designation would be considered when a Planning Act application for a new land use (e.g., golf course) or expansion to the boundary of a settlement area is submitted for approval or when municipalities are updating their official plans and zoning by-laws.

Significant natural heritage features and areas can be protected by ensuring appropriate setbacks from natural heritage features and areas in municipal land use planning documents (e.g., setbacks from significant wetlands for new or expanding agricultural building or structures).

A dual designation (e.g., prime agriculture/natural heritage system) may be a less common but useful alternative way of implementing the same types of policy approaches as those used for a natural heritage overlay designation. Under a dual designation, some permitted uses may be restricted in areas where the natural heritage component of the designation applies (e.g., to significant natural heritage features and areas).

Policy 2.1.7 confirms that natural heritage policies of the PPS are not intended to limit the continuation of existing agricultural uses. What is meant by the phrase "existing agricultural uses"? While the question of whether something qualifies as an existing use of land is often a matter to be decided on a case-by-case basis, existing agricultural uses can generally be described as encompassing a full range of agricultural uses and normal farm practices, where the agricultural use is permitted by municipal planning documents and the lands are currently used for an agricultural use. Therefore, policy 2.1.7 does not confine the continuation protection only to those activities (e.g., specific crops grown or livestock raised) existing on a farm at a point in time. Typically, a proposal to change the type, size or intensity of the agricultural use should not trigger an application under the Planning Act for a re-zoning or official plan amendment. Policy 2.1.7 should not be interpreted as supporting the establishment of new agricultural uses in natural heritage features and areas where this would not be consistent with the PPS.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

With respect to wetlands within agricultural areas, it is useful to note that the process for evaluating wetlands in Ontario relies on characteristics of the water table, soils and, in particular, wetland vegetation (see section 6.3 for more information). For example, land under agricultural use, such as cattle pasturing/grazing, often retains characteristics and functions of a wetland and thus can still be defined as "wetland." Conversely, agricultural uses such as row cropping and tillage may remove or alter wetland characteristics, and thus the lands may no longer meet the definition of "wetland." Wetland identification can provide a basis for stewardship efforts and good farming practices that support natural heritage. Wetland evaluation and identification are not meant to limit existing agricultural uses.

2.3.3 Mineral Aggregate Resources

Like the above-noted interface between agricultural and natural heritage resources, mineral aggregate resources and natural heritage resources commonly overlap. In addition to establishing a provincial interest in specific natural heritage features and areas, the PPS establishes mineral aggregate resources as an area of provincial interest. Policy 2.5.2.1 states, "As much of the *mineral aggregate resources* as is realistically possible shall be made available as close to markets as possible."

As stated earlier, the entire PPS needs to be applied when making land use decisions. The following approach can help to achieve the desired outcomes of the PPS: rehabilitation of mineral aggregate operations, implemented under the Aggregate Resources Act,[10] may be taken into consideration for the demonstration of no negative impacts (see PPS policies 2.1.4 and 2.1.6) where rehabilitation of ecological functions is scientifically feasible and is conducted consistent with policy 2.5.3.1 and other government standards.

A decision to consider rehabilitation in the demonstration of no negative impacts, according to the principle above (e.g., allowing the removal of a red pine plantation where restoration of ecological functions is scientifically feasible), would have to be made on a case-by-case basis in consultation with the local MNR district office. If approved, final rehabilitation would need to be planned to occur as soon as possible and be suited to the local natural environment.

Notwithstanding the above, in the areas covered by the Niagara Escarpment Plan, the Oak Ridges Moraine Conservation Plan, the Greenbelt Plan and Lake Simcoe Protection Plan, the policies that are contained in these provincial plans still apply (see section 2.6 for more information).

2.4 Going Beyond the PPS

> The policies of this Provincial Policy Statement represent minimum standards. This Provincial Policy Statement does not prevent planning authorities and decision-makers from going beyond the minimum standards established in specific policies, unless doing so would conflict with any policy of this Provincial Policy Statement.
>
> **Provincial Policy Statement 2005, policy 4.6**

Within the framework of the provincial policy-led planning system, planning authorities and decision makers are encouraged to build on these minimum standards to address matters that are important in a specific community or area. In developing official plan policies and when making decisions on planning matters, the PPS is not intended to prevent planning authorities and decision makers from going beyond the minimum standards established in specific policies, unless doing so would conflict with any other policy of the PPS. Direction contained in policy 4.6 may be considered by planning authorities and decision makers, as appropriate, where the manual does not explicitly discuss the concept.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

[10] Progressive and final rehabilitation of aggregate sites is required pursuant to the Aggregate Resources Act.

2.5 Official Plans

> The official plan is the most important vehicle for implementation of this Provincial Policy Statement.
>
> Comprehensive, integrated and long-term planning is best achieved through municipal official plans. Municipal official plans shall identify provincial interests and set out appropriate land use designations and policies. Municipal official plans should also coordinate cross-boundary matters to complement the actions of other planning authorities and promote mutually beneficial solutions.
>
> Municipal official plans shall provide clear, reasonable and attainable policies to protect provincial interests and direct development to suitable areas.
>
> In order to protect provincial interests, planning authorities shall keep their official plans up-to-date with this Provincial Policy Statement. The policies of this Provincial Policy Statement continue to apply after adoption and approval of a municipal official plan.
>
> **Provincial Policy Statement 2005, policy 4.5**

Policy 4.5 of the PPS describes the importance of official plans for comprehensive, integrated and long-term implementation of the PPS. To implement the natural heritage policies of the PPS, planning authorities should include policies in their official plans to:

- identify natural heritage systems and ways in which the biodiversity, connectivity and ecological functions of the system will be maintained, restored or improved;
- identify and protect natural heritage features and areas and their ecological functions;
- protect these features, areas and ecological functions from incompatible land uses and activities; and
- provide a clear and reasonable mechanism for assessing the impact of applications for land use change on these features, areas, their adjacent lands and ecological functions.

See section 12.3 for more details.

Where an official plan is in effect, the Planning Act (s. 26) requires the council of the municipality that adopted the official plan to revise it at least every five years after the plan comes into effect to ensure that it is, among other matters, consistent with policy statements (i.e., the PPS), and conforms with or does not conflict with provincial plans. Updated official plans help to ensure that policies are kept current and sensitive to changing local circumstances and to provincial policies. They can also help lessen the need for amendments between reviews and provide up-to-date, reliable information for those preparing planning applications.

Regardless of whether or not an official plan has been revised, decisions will still need to address section 3(5) of the Planning Act, which requires that decisions on planning matters shall be consistent with policy statements that are in effect on the date of the decision.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

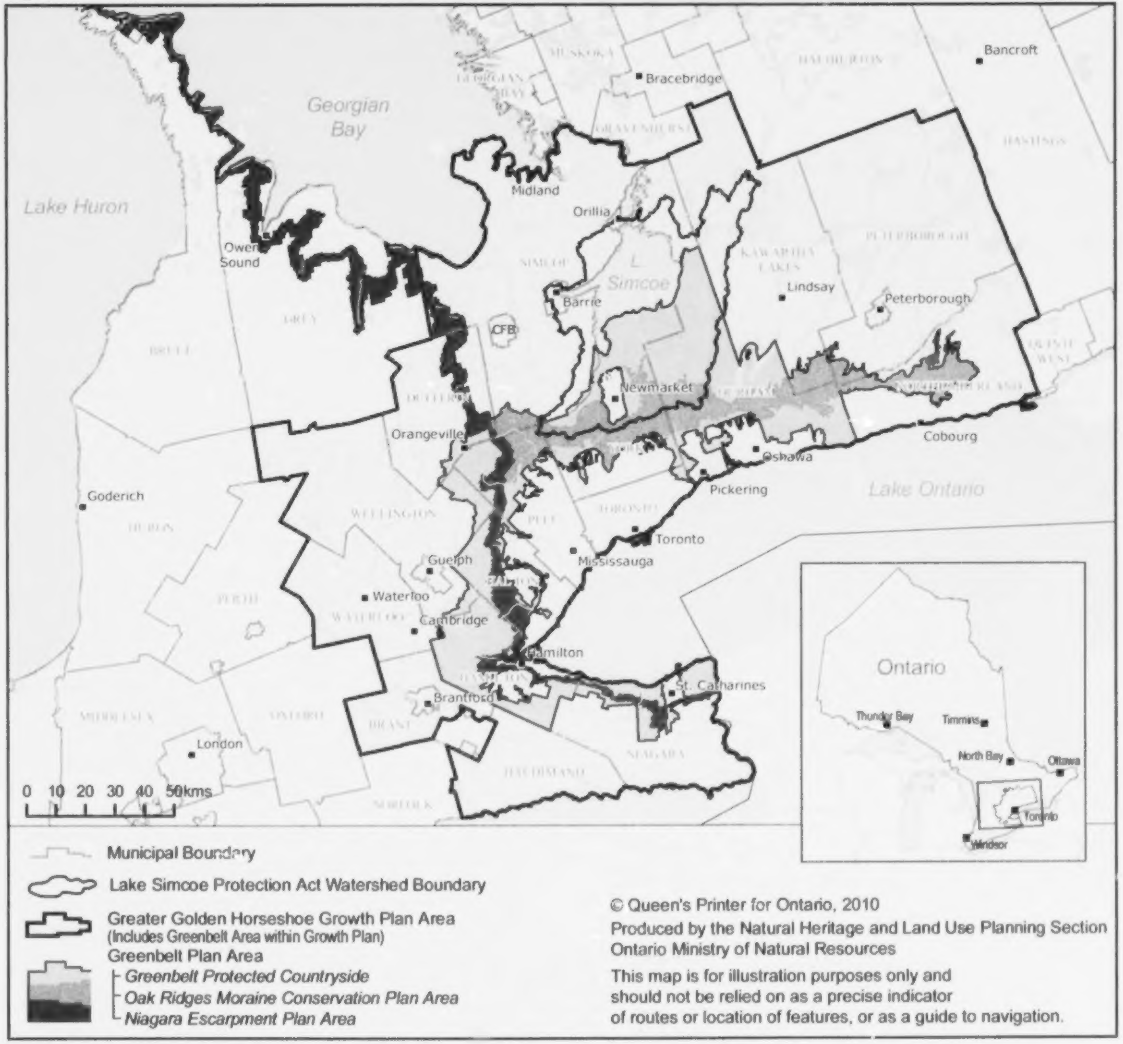
2.6 Provincial Plans[11]

A number of provincial plans (see figure 2-1) guide and regulate land use planning for specific areas in southern Ontario. These include the following:

- Parkway Belt West Plan (1978)
- Oak Ridges Moraine Conservation Plan (2002)
- Greenbelt Plan (2005)
- Niagara Escarpment Plan (2005)
- Growth Plan for the Greater Golden Horseshoe (2006)
- Central Pickering Development Plan (2006)
- Source protection plans when approved under the Clean Water Act (2006)
- Lake Simcoe Protection Plan (2009)

For information on accessing these plans, see section 15.

Figure 2-1: Provincial Plans


Georgian Bay
Lake Huron
Lake Ontario
L. Simcoe
Bancroft
Bracebridge
Midland
Orillia
Owen Sound
Barrie
CFB
Lindsay
Peterborough
Newmarket
Orangeville
Cobourg
Oshawa
Pickering
Goderich
Toronto
Mississauga
Guelph
Waterloo
Cambridge
Hamilton
St. Catharines
Brantford
London
Ontario
Thunder Bay
Timmins
North Bay
Ottawa
Toronto
Windsor
0 10 20 30 40 50kms
Municipal Boundary
Lake Simcoe Protection Act Watershed Boundary
Greater Golden Horseshoe Growth Plan Area
(Includes Greenbelt Area within Growth Plan)
Greenbelt Plan Area
Greenbelt Protected Countryside
Oak Ridges Moraine Conservation Plan Area
Niagara Escarpment Plan Area

© Queen's Printer for Ontario, 2010
Produced by the Natural Heritage and Land Use Planning Section
Ontario Ministry of Natural Resources

This map is for illustration purposes only and should not be relied on as a precise indicator of routes or location of features, or as a guide to navigation.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

[11] To understand the interaction of the PPS with specific provincial plans or policies, consultation with appropriate planning and/or legal experts is recommended. The information in this section is of a general nature and should not be relied on as professional planning or legal advice regarding the interaction of provincial plans with the PPS.

2.6 Provincial Plans

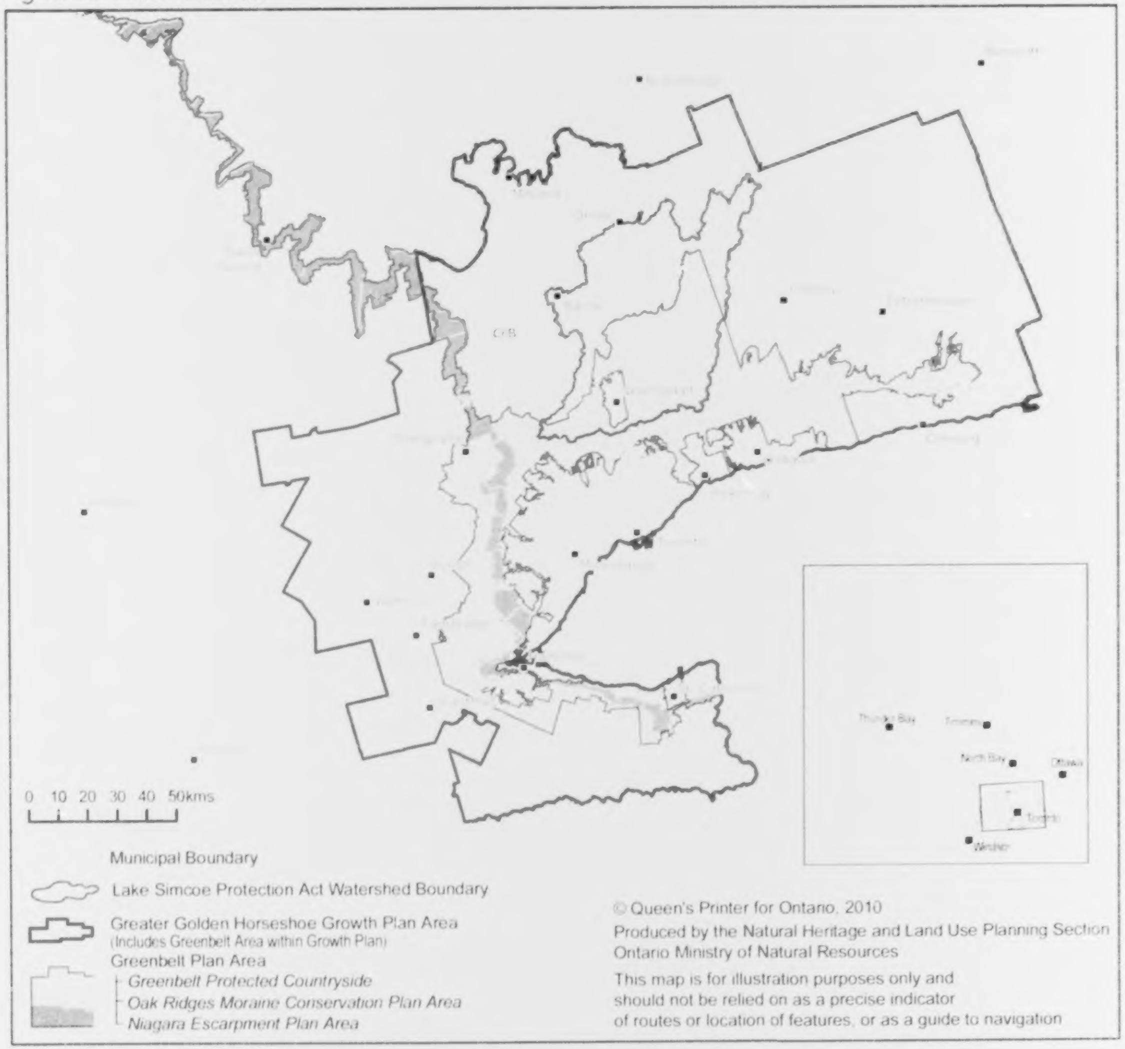
Quick Links

A number of provincial plans (see figure 2-1) guide and regulate land use planning for specific areas in southern Ontario. These include the following:

- Parkway Belt West Plan (1978)
- Oak Ridges Moraine Conservation Plan (2002)
- Greenbelt Plan (2005)
- Niagara Escarpment Plan (2005)
- Growth Plan for the Greater Golden Horseshoe (2006)
- Central Pickering Development Plan (2006)
- Source protection plans when approved under the Clean Water Act (2006)
- Lake Simcoe Protection Plan (2009)

For information on accessing these plans, see section 15.

Figure 2-1: Provincial Plans


0 10 20 30 40 50kms
Municipal Boundary
Lake Simcoe Protection Act Watershed Boundary
Greater Golden Horseshoe Growth Plan Area
(Includes Greenbelt Area within Growth Plan)
Greenbelt Plan Area
Greenbelt Protected Countryside
Oak Ridges Moraine Conservation Plan Area
Niagara Escarpment Plan Area
Thunder Bay
Timmins
North Bay
Ottawa
Toronto
Windsor

© Queen's Printer for Ontario, 2010
Produced by the Natural Heritage and Land Use Planning Section
Ontario Ministry of Natural Resources
This map is for illustration purposes only and
should not be relied on as a precise indicator
of routes or location of features, or as a guide to navigation

In areas of the province to which they apply, the Niagara Escarpment Plan, the Oak Ridges Moraine Conservation Plan (ORMCP), the Greenbelt Plan and the Lake Simcoe Protection Plan build on the PPS and provide substantial policy direction on the protection of natural heritage features. Technical papers to aid in the implementation of the ORMCP were finalized in 2007, and some similar materials are being developed for the Greenbelt Plan. While the criteria developed for these plans do not apply outside the plan area, municipalities may wish to apply the more restrictive criteria, provided that they do not conflict with any other matter of provincial interest.

It is essential that planning authorities and other users of this manual consult all relevant provincial plans and corresponding guidance materials when addressing land use planning matters that fall within the jurisdiction of any of those plans.

The Greenbelt Plan provides specific direction that the policies of the ORMCP and the Niagara Escarpment Plan will continue to apply in their areas of application. For the Protected Countryside areas of the Greenbelt within the Parkway Belt West Plan, policies of section 3.2 of the Greenbelt Plan apply.

In general, where the provincial plans and the PPS conflict, provincial plans take precedence over the PPS as specified in policy 4.9 of the PPS. Likewise, the PPS would provide policy direction in the case of a matter that the provincial plans do not address. (For example, the ORMCP does not contain specific hazard land policies; therefore, the hazard policies of the PPS apply, even in the ORMCP area.) The manual is relevant within the areas of provincial plans when the PPS is looked to for policy direction on natural heritage.

In some cases, the applicability of the PPS is explicitly noted in provincial plans; for example, section 3.2.4 (3) of the Greenbelt Plan notes:

> Beyond the Natural Heritage System within the Protected Countryside (as shown on Schedule 4), key natural heritage features are not subject to the natural features policies of section 3.2.4 of this Plan, but are to be defined pursuant to, and subject to the policies of, the PPS.

In affected portions of Ontario, planning documents and decisions affecting a land use planning matter must also conform with the applicable growth plan (e.g., Growth Plan for the Greater Golden Horseshoe [GGH Growth Plan]). The Places to Grow Act provides that a growth plan prevails where there is a conflict between it and the PPS. The only exception is where the conflict is between policies relating to the natural environment or human health. In that case, the policy that provides more direction about the natural environment or human health prevails.

Similarly, as provided for in the Lake Simcoe Protection Act, 2008, decisions affecting a land use planning matter must conform with the applicable designated policies in the Lake Simcoe Protection Plan and have regard to the other applicable policies. If a conflict arises between a designated policy in the Lake Simcoe Protection Plan and one in the PPS, the provision that gives the greatest protection to the ecological health of the Lake Simcoe watershed prevails.

Protecting drinking-water sources is also an important part of protecting natural heritage resources, green spaces and the environment. Source protection plans, when approved under the Clean Water Act, 2006, establish a locally driven, science-based, multi-stakeholder approach for protecting drinking-water sources and promoting the notion of stewardship. The Clean Water Act, 2006 complements the PPS and provincial plans. Where a conflict exists between provisions of a source protection plan and other plans and policies that may affect the quality or quantity of drinking water in a vulnerable area, the provision that provides the greatest protection to the quality or quantity of drinking water prevails.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

3.0 NATURAL HERITAGE SYSTEMS

3.1 General Concepts of Natural Heritage Systems

A natural heritage system is an ecologically based delineation of nature and natural function – a system of connected or to be connected green and natural areas that provide ecological functions over a longer period of time and enable movement of species. Natural heritage systems encompass or incorporate natural features, functions and linkages (also referred to as "corridors") as component parts within them and across the landscape. They also enable the linking of different landscapes.

The concept of planning for the conservation of natural heritage on a systems basis is used worldwide including in Florida (Oetting et al., 2006), British Columbia (Warman et al., 2004), Australia (Margules and Pressey, 2000) and South Africa (Cowling et al., 2003).

In Ontario, the approach is described in Riley and Mohr (1994) and is embraced in the PPS. Moreover, section 2 of the Planning Act states that the protection of ecological systems including natural areas, features and functions is a provincial interest This section of the manual addresses the protection of ecological systems, covering the relevant policies of the PPS and key concepts applied in identifying natural heritage systems.

A suggested comprehensive approach to planning for a natural heritage system is provided in appendix A.4, including discussion of implementation and monitoring. The literature on these subjects is extensive, and some primary references are provided in section 16 and the works cited section.

3.2 Policy Explanation

> The diversity and connectivity of natural features in an area, and the long-term *ecological function* and biodiversity of *natural heritage systems*, should be maintained, restored or, where possible, improved, recognizing linkages between and among *natural heritage features and areas, surface water features* and *ground water features*.
>
> **Provincial Policy Statement 2005, policy 2.1.2**
> *Italics indicate terms further defined in the PPS*

The PPS provides policy direction on planning for a connected natural landscape that will support biodiversity, be ecologically functional and recognize linkages between and among natural heritage and water features. Related policy direction on using coordinated approaches for dealing with ecosystem-, shoreline- and watershed-related issues is discussed later in this section.

Policy 2.1.2 uses enabling language that allows for discretion in the ways planning authorities are to be consistent with the PPS. All elements of this policy need to be considered when determining how to be consistent with it. While the PPS defines many of these elements, the common meanings of terms such as "connectivity" and "biodiversity" should not be overlooked.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

> **Natural heritage system:** means a system made up of *natural heritage features and areas*, linked by natural corridors which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems. These systems can include lands that have been restored and areas with the potential to be restored to a natural state.
>
> **Provincial Policy Statement 2005, Section 6.0 Definitions**
> *Italics indicate terms further defined in the PPS*

Identifying and planning for natural heritage systems ideally are achieved through a comprehensive approach provided that the approach is consistent with the PPS definition for "natural heritage system." An approach consistent with the PPS involves the inclusion of the fundamental components and characteristics (e.g., diversity and connectivity; long-term ecological function and biodiversity; linkages with natural heritage and water features) outlined in section 3.4. Examples of comprehensive approaches include landscape- and features-based analyses.

Planning authorities undertake landscape analysis by evaluating the contributions of all land cover and habitats to the ecological function and biodiversity of the landscape, and examining deficiencies that should be rectified to address diversity and connectivity. A features-based analysis involves establishing a system that builds connections between known or already protected features.

A comprehensive approach was fundamental in the development of the ORMCP and the Greenbelt Plan. This supported the designation of "natural core" and "natural linkage" areas in the ORMCP and the designation of the natural heritage system as an overlay in the Greenbelt Plan. Planning authorities can identify natural heritage systems comprehensively for use in their official plans.

Natural heritage system policies and designations that are incorporated into official plans will provide the guidance on protection requirements in a particular jurisdiction. Further discussion of this topic is provided in section 12.3.4.

Even if natural heritage systems have not been identified comprehensively, the concepts applied in such a comprehensive approach should be considered at the site development and impact assessment stages of the land use planning process. The guidance provided below regarding the identification of natural heritage systems contains principles that could be addressed at this stage of the land use planning process. For example, the retention of likely linkages or opportunities for connectivity prior to development and the promotion of ecological integrity within identified features by avoiding development and site alteration on functioning adjacent lands would be consistent with policy 2.1.2. As described further in section 3.4.1, approaches need to be adapted according to the nature of the landscape. Ultimately, proponents should demonstrate how their proposals are consistent with policy 2.1.2.

The PPS definition for "natural heritage system" means that areas with the potential to be restored can be components of a system. Such lands may be agricultural (see section 3.4.5), semi-natural or less intensively managed/used areas that contribute to the long-term ecological functions (e.g., as linkages) or are areas that are ideally located for purposes of restoring or improving, with the participation of willing landowners, habitats and natural connections.

Policy 2.1.2 is not exclusive of the other policies for natural heritage under section 2.1. The manual supports (and emphasizes the importance of) planning for natural heritage systems, but planning must also be consistent with the PPS policies about development and site alteration in significant natural heritage features and areas, in fish habitat and on adjacent lands for those natural heritage features and areas.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

> **Natural heritage features and areas:** means features and areas, including *significant wetlands, significant coastal wetlands, fish habitat, significant woodlands* south and east of the Canadian Shield, *significant valleylands* south and east of the Canadian Shield, *significant habitat of endangered species* and *threatened species, significant wildlife habitat,* and *significant areas of natural and scientific interest,* which are important for their environmental and social values as a legacy of the natural landscapes of an area.
>
> **Provincial Policy Statement 2005, Section 6.0 Definitions**
> *Italics indicate terms further defined in the PPS*

It is also important to consider the meaning of the PPS definition for "natural heritage features and areas" shown above, because that term is embedded in the definition for "natural heritage system." By definition, the features covered in policies 2.1.3, 2.1.4 and 2.1.5 of the PPS are included, but are not necessarily the only features and areas that could be considered important for their environmental and social value. Thus, a natural heritage system may also contain features that are considered significant at watershed, regional or local scales.

3.2.1 Coordinated, Integrated and Comprehensive Approaches

> A coordinated, integrated and comprehensive approach should be used when dealing with planning matters within municipalities, or which cross lower, single and/or upper-tier municipal boundaries, including: …
>
> b) managing natural heritage, water, agricultural, mineral, and cultural heritage and archaeological resources; …
>
> d) ecosystem, shoreline and watershed related issues; …
>
> **Provincial Policy Statement 2005, policy 1.2.1**

Planning for natural heritage systems facilitates the coordination of ecosystem-based and watershed-based issues across planning authority boundaries, as recognized in policies 1.2.1(b) and (d) of the PPS by recognizing important linkages (e.g., features such as valleylands, and ecological functions such as hydrological connectivity) that extend beyond planning area boundaries.

Refer to section 12 and section 13 for further guidance on planning techniques and tools for the protection of natural heritage systems and the considerations for addressing the impacts of development and site alteration.

Quick Links

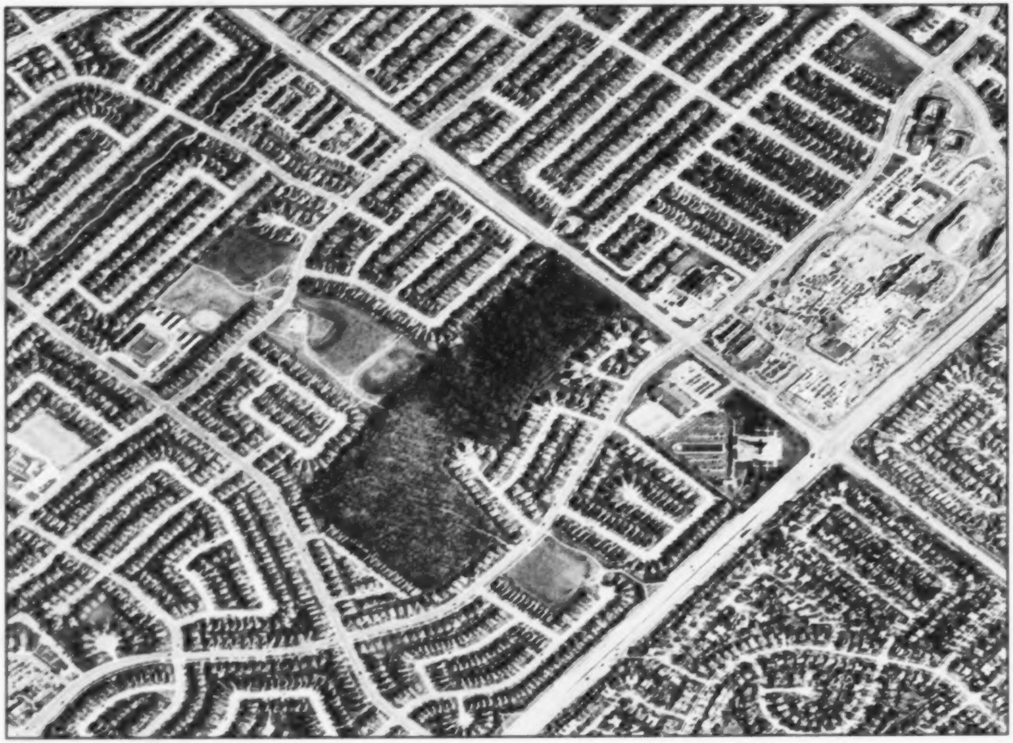
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

3.3 Why Protect?

Stresses on the natural environment from human activity are particularly evident in southern Ontario where land use changes have resulted in large-scale conversion of the pre-settlement landscape through forest clearing and wetland conversion. The prevailing patterns of growth and settlement have not always been sensitive to the fact that individual features and areas have strong ecological ties to each other, as well as to other physical features and areas in the overall landscape.

Historic planning approaches to protecting natural heritage have been limited to trying to preserve remnant individual features in a reaction to development pressure. At a landscape level, this approach has led to isolated and fragmented natural features and areas. Compared to features that were part of a connected system, isolated features have lower ecological functioning. Figure 3-1 provides an example of an isolated natural feature that could have had its ecological functioning maintained through better land use planning design (i.e., creating linkages between features). By developing natural heritage systems, planning authorities can proactively maintain or restore linkages between features and begin to address these issues and other planning concerns, as detailed in table 3-1 below.

Figure 3-1: Example of an Isolated Natural Feature with Lower Ecological Functioning



Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 3-1: Planning Concerns and Potential Benefits of Natural Heritage Systems

PLANNING CONCERN	DESCRIPTION AND POTENTIAL NATURAL HERITAGE SYSTEM BENEFITS
Landscape fragmentation	Loss of landscape connectivity, commonly known as landscape fragmentation, refers to the process by which large, interconnected natural areas are converted to a series of smaller, often isolated natural areas. Fragmentation is a severe threat to the survival of many wildlife species, particularly area-sensitive species and/or those with large home ranges. As habitat is lost or fragmented, residual habitat patches become smaller and more isolated from each other (measured as a reduction in total habitat area, reduction in patch size, increasing number of patches and distance between patches) (Bailey, 2007). The resultant isolation of one wildlife population from another can: • prevent, or make difficult or more dangerous, movement among areas used for feeding, shelter or resting; • disrupt seasonal movements needed to complete life cycles of some wildlife (e.g., amphibians, which overwinter in woodlands but migrate to ponds in the spring to breed); • prevent dispersal of juveniles to other habitats in the area where better habitat conditions may exist; • lead to inbreeding that, over time, may reduce the ability of the population to adapt to changing environments; and • prevent the recolonization of an area after local extinctions. Fragmentation limits the movement of species in several ways: (1) many species avoid or cannot cross boundaries; (2) species' ability and willingness to move between patches and the degree of success species have in doing so are affected by the distance between patches and by the nature and use of the intervening landscape matrix; and (3) species' ability to detect and successfully settle in a different suitable habitat patch is affected by the distance between patches (Baguette and Van Dyck, 2007). These fragmentation outcomes lead to habitat degradation and modification, edge effects, overcrowding and invasion by non-native species. Increased isolation of species, compounded with other stresses, puts them at greater risk of disappearing from a region (Wilderness Society, 2004). Planning for natural heritage systems addresses fragmentation by identifying and protecting core areas, ecological linkages and landscape features that contribute to a system. This facilitates not only the maintenance of ecological function and biodiversity, but also the restoration and improvement of these things through stewardship (e.g., by identifying ecologically appropriate areas for enhancement and/or reconnection).
Biodiversity	The effects of landscape fragmentation have been well documented and are recognized as one of the leading causes of biodiversity decline (Noss et al., 2006). Indicators of biodiversity loss include the numbers of species that are identified as "at risk" (i.e., extirpated, endangered, threatened or of special concern; see section 5) and the pace at which species are added to the at-risk categories. These indicators and other global measures suggest a worsening situation for biodiversity. With appropriate mechanisms for protection of the features and maintenance of the linkage aspects of natural heritage systems, biodiversity values can be protected for the long term.

(continued on next page)

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 3-1 *(continued from previous page)*

PLANNING CONCERN	DESCRIPTION AND POTENTIAL NATURAL HERITAGE SYSTEM BENEFITS
Climate change	Stress due to climate change forces organisms (including humans) to adapt or relocate. An increase in the frequency of extreme weather events (e.g., intense storms, drought) may affect habitats, particularly habitats that are localized (i.e., separated from other natural areas). Organisms (particularly those in localized habitats) that cannot adapt or relocate face extirpation or extinction. Protecting natural heritage systems – encompassing areas within which species can successfully carry out their life processes and potentially adapt, facilitating their movement to more suitable habitat, or enabling a destroyed habitat/population to be replenished – will improve species' ability to adjust to climate change.
Ecosystem health and healthy communities	Ecosystem health and healthy communities are inextricably linked, as is emphasized in Ontario's Biodiversity Strategy (see section 15 to access an electronic copy): Ecosystem health can be characterized as a measure of the level of distress in the ecosystem, its resilience and adaptability, the ability to sustain itself, the degree to which adjacent ecosystems are affected and the extent to which the ecosystem supports healthy human communities. To support the resource demands (e.g., food, water and shelter) of local communities, planning authorities need to maintain the ecological health of the natural environment to ensure that it can withstand the stresses that present and future human populations place on it. By protecting a natural heritage system that includes surface- and groundwater features (see section 3.2.1), planning authorities promote the resiliency of natural features to function for the long term and maintain overall ecosystem and human health. Healthy, resilient and diverse natural environments are important land use components that influence human activity, facilitate health and mental well-being and promote social interaction and inclusion (Ministry of Municipal Affairs and Housing and Ontario Professional Planners Institute, 2009).
Ecosystem services	Ecosystem services are the benefits that people gain from ecological systems. These services are the basis for human well-being and the economic value of our landscape and economy (Troy and Bagstad, 2009). Natural heritage systems deliver essential ecosystem services such as clean water and air, productive soils and flood attenuation. Degradation of Ontario's ecosystem services can lead to unacceptable risks (e.g., soil erosion and flooding) to human well-being. Maintaining a natural heritage system is a precautionary approach that reduces risk and is more cost-effective than addressing problems after development has occurred and the ecosystem services are lost.

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 3-1 *(continued from previous page)*

PLANNING CONCERN	DESCRIPTION AND POTENTIAL NATURAL HERITAGE SYSTEM BENEFITS
Ecosystem services	At a basic level, natural heritage systems provide ecosystem services required for healthy, vibrant communities that include: • photosynthesis: capturing the sun's energy and converting it to biomass; • transpiration: cleaning the air and releasing clean water vapour into the atmosphere; to make rain and drive the hydrological cycle; and • nitrogen fixation: capturing nitrogen for plant growth; and decomposition: returning nutrients to the soil.
Planning process efficiencies	Natural heritage system planning can assist with the identification of the most important natural heritage features within a planning area (e.g., key features for achieving representation within the study area, key features that contribute to connectivity). Taking a comprehensive landscape-level approach allows planning authorities to identify a community's priorities and inform subsequent site-level planning, which can focus subsequent studies on the areas most likely to be sensitive to impacts. This comprehensive approach can also assist a planning authority to proactively identify significant natural heritage features and areas as part of being consistent with PPS policies 2.1.3, 2.1.4, 2.1.5 and 2.1.6.

As populations grow, additional demand is placed on the land and resources of communities. Communities need to identify priorities when reconciling land use planning differences. Natural heritage systems planning allows communities to identify and prioritize conservation opportunities and plan development in ways that optimize the use of land to meet the needs of people and nature (Benedict and McMahon, 2006).

3.4 Identification

The following sections describe the fundamental network components of natural heritage systems (core areas and linkages), attributes of these components, general/functional attributes of systems and other considerations for the identification of natural heritage systems.

More information on the key ecological concepts for natural heritage systems is provided in section 3.4.3 and appendix A.2. Given the complexity of this field, planning authorities should consider ecological expertise to be important in any process to identify natural heritage systems.

Information sources for the identification and evaluation of natural heritage systems are provided in appendix B.

3.4.1 Landscape Context General Characteristics

Variations in landscape context (e.g., land cover and land use patterns) mean that natural heritage systems will vary in size and form. For example, in southern Ontario areas where human disturbance has resulted in fragmentation and a loss of connectivity among remnant natural features, planning for a natural heritage system is largely an exercise to maintain or develop a connected natural system.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Here, woodlands and wetlands are generally discrete units in an otherwise developed landscape and as such can be identified as natural heritage features forming a basis for the natural heritage systems design. In areas of the Canadian Shield, however, often forest cover is relatively continuous and forest and wetlands are often contiguous. In such situations, a different approach may be needed, such as protecting and maintaining a connected system of high-quality habitat within the forest landscape.

3.4.1.1 Integration with Other Landscape Areas and Scales

The broader landscape context (i.e., linkages to natural heritage features and systems beyond the municipal boundaries) should be taken into account. One way of achieving this is by using Ontario's Ecological Land Classification (ELC) system to organize ecological information. As described in the Ecological Land Classification Primer (see section 15 to access an electronic copy), the ELC hierarchy and associated products are multi-scale and extend from a broad provincial level down to very fine-scale vegetation and substrate levels. This classification of the landscape enables planners and ecologists to organize ecological information into logical integrated units, enabling activities that include planning, monitoring and setting targets for natural heritage systems.

As directed in PPS policy 2.2.1(a), watersheds are to be used as the ecologically meaningful scale when planning to protect, improve or restore the quality and quantity of water as part of identifying natural heritage systems and incorporating aquatic features. These units have been and continue to be the basis for work by a number of government agencies, ministries and municipalities.

While watershed and ecodistrict boundaries do not correspond because they are delineated on different bases, each has its merits for the purposes of analyzinga landscape. A comprehensive natural heritage system will have had ecology examined at these and broader landscape scales.

3.4.2 Natural Heritage System Components

3.4.2.1 Core Areas

Core areas are generally the building blocks of natural heritage systems. Where natural cover is not predominant, these are areas having a higher percentage density of natural cover than other parts of the landscape. As such, core areas should be capable of providing and sustaining ecological functions. Core areas could consist of one feature or a collection of features that could include a mix of ecosystem types (e.g., grasslands, alvars, woodlands, wetlands).

The size of these core areas could vary, depending on the landscape of the planning or study area. For example, the minimum core size was about 500 hectares in the provincial-scale natural heritage system of the Oak Ridges Moraine. In a planning area with a low percentage of natural feature cover, the size of the core areas would probably be smaller and, in some cases, an individual feature may make up the core area. In some other areas or in smaller planning areas, trying to break a natural heritage system into cores and linkages might not be possible. For those situations, natural heritage systems are more about the inclusion of a high percentage of existing natural areas and connectivity within and among these natural areas.

Characteristics of features and areas that can contribute as core areas to a natural heritage system are identified in table 3-2. A core area need not possess every desired attribute, but the possession of multiple attributes signifies the higher relative importance of a candidate core area. In some jurisdictions with little or no natural cover, degraded natural areas with limited core area attributes may need to be identified as rehabilitation priorities to support a future functioning natural heritage system.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 3-2: Natural Heritage System Core Area Attributes

CORE AREA ATTRIBUTE	DESCRIPTION
Size	• The larger the area, the better, but it must be recognized that size is relative to the attributes of the landscape and is not the only consideration.
Completeness (integrity) and degree of naturalness	• An area that stands out as having contiguousness and more natural cover relative to another area would be an important candidate. • The planning authority could establish a benchmark minimum as a criterion for a core area (e.g., core areas in the ORMCP area are composed of at least 50 per cent natural cover/protected area).
Shape	• A wide core area is better than a narrow one; a high interior-to-edge ratio is better than a low one.
Habitat and species diversity	• A core area should have a diversity of habitats and species, although disturbed or cultural areas can have a high diversity of non-native or highly adaptable species, which may not be suitable for a core area, while some important natural habitats (e.g., bogs) can have a low diversity. • Many species use more than one habitat type to meet their habitat requirements (i.e., breeding, foraging, nesting, rearing of young, overwintering) throughout the various stages of their lifecycle (e.g., wood frogs need vernal pools for breeding and woodlands for foraging and overwintering.)
Presence of interior habitat	• A core area consisting of woodlands with interior habitat, defined as habitat more than 100 metres from the edge of the woodland, is important for some species (Askins et al., 1987; LandOwner Resource Centre and Ontario Ministry of Natural Resources, 2000). • Interior habitat of a core area is affected by its size and shape.
Presence of rare habitats and species	• In fragmented landscapes, core areas are often the last remaining patches for rare habitat and species and should be included in natural heritage systems.
Presence of sensitive natural communities	• Core areas often limit human disturbances and thus allow sensitive plant and animal species to exist.
Presence of natural communities not well represented in the landscape	• Core areas that contain poorly represented natural communities are valuable for maintaining biodiversity.
Potential for connectivity	• Core areas that happen to be situated near each other or to other landscape elements would exhibit opportunities for existing or restored connectivity.

(continued on next page)

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 3-2 *(continued from previous page)*

CORE AREA ATTRIBUTE	DESCRIPTION
Presence of important hydrological areas	• Core areas that contain important hydrological areas (e.g., wetlands, headwaters, recharge areas, discharge areas) are valuable.
Geological diversity	• Core areas that contain geological diversity (e.g., karst topography, caves, cliffs, alvars, rock barrens) are valuable.
Potential for augmentation through stewardship	• A candidate area possessing other attributes would be of more interest if it had the potential to be enlarged or improved (e.g., because adjacent land use patterns and activities are favourable); this factor also could invite consideration of an area that is less complete or has less natural cover.
Protection already in place	• An area for which the ownership or legal interest in the lands and waters provides a secure future (e.g., park, conservation area) would be a good candidate.
Significance already established	• The presence of one or more provincially significant features could indicate an area's potential as a core area.
Potential to persist	• If land use changes that have already occurred or been approved would lead to the degradation of the natural feature or area, it may not be a good candidate area. • Natural features or areas that have lowered ecological functioning resulting from past land use changes may still be important, depending on the landscape context.

3.4.2.2 Linkages/Corridors

Linkage (also referred to as "corridor") components of natural heritage systems should be designed to accommodate the natural movement patterns of plants and animals because movement is necessary for biodiversity conservation and the long-term viability of ecological systems. In identifying a natural heritage system, linkages that are ecologically functional should be incorporated. This means that a linkage should be of sufficient width, especially in proportion to length, and composed of appropriate habitat or potential for restored habitat to allow the movement of wildlife and dispersal of flora. Lands with natural cover best serve this purpose; however, lands with limited natural cover can provide some linkage functions, depending on species and organism.

In addition, the orientation and configuration of a linkage should be designed to lead wildlife to suitable habitats so that wildlife is not funnelled into inhospitable areas (e.g., highways, urban areas).

Thus, linkages should not be just a "green line" drawn on a land use plan; they should be designed to reflect the needs of the local biota. This may mean working with an experienced conservation biologist and/or computer models that facilitate the identification of potential linkages.

Characteristics of features and areas that can contribute as linkages in a natural heritage system are identified in table 3-3 below. A linkage need not possess every desired attribute, but the possession of multiple attributes signifies the higher relative importance of a candidate linkage.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

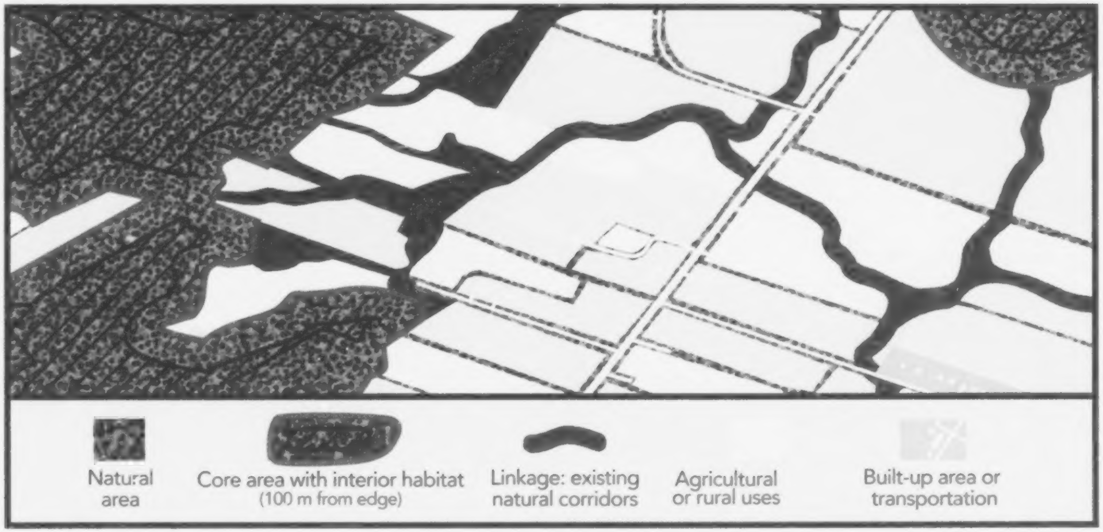
Table 3-3: Natural Heritage System Linkage Attributes

LINKAGE ATTRIBUTE	DESCRIPTION
Ecological function	• The linkage is ecologically functional, taking into account the needs of species. • The linkage corresponds to wildlife movement corridors.
Scale	• The dimensions of the linkage are appropriate to the scale of planning.
Built-in redundancy	• Multiple linkages and alternative pathways give species options for movement from one area to another.
Use of stepping stone approach where unbroken linkages are impossible	• The linkage contains habitat patches that provide temporary refuges that facilitate movement between core areas of habitat.
Ecological appropriateness	• The linkage reflects a natural relationship between core areas or features being connected.
Suitability of the path	• The linkage provides opportunities for species to cross it successfully.
Ability of surrounding land uses to mitigate negative impacts	• The uses of lands surrounding the linkage should be able to mitigate negative impacts vs. acting as potential stressors.
Connection to landforms and areas with high restoration potential	• The linkage connects areas that could provide habitat in the future.
Association with two or more core areas	• The linkage should allow for movement between core areas.
Water features	• Riparian and shoreline linkages are valuable because the land–water interface usually supports a high level of biodiversity and meets multiple species needs.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Figure 3-2: Natural Areas Supporting Core and Linkage Functions


Natural area
Core area with interior habitat (100 m from edge)
Linkage: existing natural corridors
Agricultural or rural uses
Built-up area or transportation

Natural areas shown in figure 3-2 could include lands that have been restored. Additional lands with the potential to be restored to a natural state (with willing landowners) could be included when a natural heritage system is designed.

3.4.2.3 Considering "Natural Heritage Features and Areas"

> **Natural heritage features and areas:** means features and areas, including *significant wetlands, significant coastal wetlands, fish habitat, significant woodlands* south and east of the Canadian Shield, *significant valleylands* south and east of the Canadian Shield, *significant* habitat of *endangered species* and *threatened species, significant wildlife habitat,* and *significant areas of natural and scientific interest,* which are important for their environmental and social values as a legacy of the natural landscapes of an area.
>
> **Provincial Policy Statement 2005, Section 6.0 Definitions**
> *Italics indicate terms defined in the PPS*

The natural heritage features and areas identified in the PPS and described in section 4 are logically essential components of natural heritage systems. While most of these natural features and areas will be part of the identified system, not all will be contained in a connected system, owing to the scattered pattern of these areas and/or their lack of potential ecological connection to other areas. Nonetheless, specific natural heritage features and areas already identified as "significant" (as defined in the PPS) will be protected in accordance with the PPS regardless of whether they are included in or stand apart from an identified natural heritage system. This protection should be supported by identifying in planning documents those natural features and areas that are known to be significant for purposes of the PPS. Many natural features and areas are not mapped, since they have not been previously identified due to their small size or lack of evaluation (see section 4.2.1 for further discussion.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

> **Significant:** means … d) in regard to other features and areas in policy 2.1, ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or *natural heritage system*; …
>
> **Provincial Policy Statement 2005, Section 6.0 Definitions**
> *Italics indicate terms defined in the PPS*

Natural heritage features and areas identified as "significant" as defined in the PPS are not the only components that should make up a natural heritage system. The PPS definition for "significant" stresses that the contributions of other natural heritage features to a natural heritage system should be factored into the determination of their significance. This is further discussed in other sections, including those on core areas, linkages and ecological importance or integrity.

The PPS definition for "significant" does not mean that every individual feature included in a natural heritage system will be physically connected to other features by natural cover. There may be functional connections between a feature and another part of the system, where the intervening lands do not act as a complete barrier even though they are not in a natural state.

Significant natural heritage features and areas are typically used as a starting point for features-based approaches to identifying natural heritage systems. A natural heritage system, delineated through a features-based approach, should be assessed to confirm that major core areas and linkages are identified. The system may have to be enhanced by adding missing system attributes identified on the basis of these assessments.[12]

Although landscape-based approaches incorporate significant natural features and areas, such features are not relied on exclusively as starting points. As with a features-based approach, systems delineated through a landscape-based approach should be assessed to identify major core areas, linkages and missing attributes (e.g., significant habitat of endangered and threatened species). In some cases, a landscape-based approach taken by a planning authority may determine that some previously unevaluated features (e.g., areas that serve as temporary refuges or stepping stones for species movement or provide representation of a wider range of habitats) are "significant" as defined in the PPS, due to their role as part of the identified natural heritage system.

It must be recognized that certain small-scale natural heritage features and areas (e.g., significant wildlife habitat) generally cannot be identified by a comprehensive study and can be identified only at the time of individual development proposals (see section 4.2 for further discussion).

3.4.3 Considering Ecological Functions and Promoting Ecological Integrity

One of the most important steps in planning for natural heritage systems is to identify natural areas within a planning area and assess their importance in terms of ecological functions. Each candidate site can be evaluated using several factors, since natural heritage features and areas provide many values. It is often necessary, however, to rely on a limited number of factors, due to constraints related to budget, time or information.

Ecological importance can be evaluated on the basis of the measures listed in table 3-4 below, which are further explained in appendix A.2.

---

[12] A natural heritage system delineated through a previous planning process is not invalidated by further assessment; however, the assessment may identify parts of the system that could be strengthened and should be addressed through a future planning process.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 3-4: Ecological Function Measures of Natural Features and Areas for a Natural Heritage System

REPRESENTATION/DISTRIBUTION	
	• The full range of natural features that occur in an area, including both rare and common features, should be protected as a fundamental step in natural heritage system planning to preserve biodiversity at the species and community levels.
CORE/PATCH ATTRIBUTES	
a. General	• Where large core areas do not exist, groupings of habitat patches or patches with the potential for restoration should be included to maintain ecological functions at a landscape level. • Including a cluster of a natural areas that span a range of habitats may support a greater diversity of ecological processes (see discussion in appendix A.2.3.6).
b. Size	• Generally, large patches of natural area are more valuable than smaller patches. • The overall amount of habitat in the landscape is also a consideration and may be more important than the size of individual patches. • A single large patch is generally better than several smaller patches that together constitute the same total area as the large patch.
c. Shape	• The shape of natural heritage areas affects their value as wildlife habitat and their resilience to disturbance effects. • Round or block-shaped patches contain less edge per unit of area than long, narrow patches.
d. Proximity/ connectedness	• Blocks of habitat that are arranged close together limit fragmentation and are usually better than blocks of habitat that are located farther apart.
LINKAGE/CORRIDOR ATTRIBUTES	
a. General	• The nature of a linkage will depend on the ecological function that the linkage is intended to perform. • Factors that may affect the ecological function of a linkage include its length and width (generally, a wider linkage is better, and the width of a linkage should increase relative to its length), composition, orientation and configuration. • The significance and relative importance of these factors vary with the needs of different species. • Some linkages may serve to connect habitat for particular species to complete their life cycles (e.g., linkages between wetlands and upland areas to allow for reptiles and amphibians to move between breeding and summer/winter habitat). • The ecological appropriateness of a corridor should be considered when identifying linkages. • Corridors should be assessed as to whether there is a natural relationship between the core areas or features being connected, especially when identifying linkages that should be restored or established in fragmented landscapes.

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 3-4 *(continued from previous page)*

LINKAGE/CORRIDOR ATTRIBUTES	
a. General	• Alternative or multiple linkages in a natural heritage system can assist in maintaining its ecological functions, as well as its overall ecological integrity. • Smaller patches of natural cover that are closely spaced can serve as stepping stones for species movement, and thus be identified as a linkage.
b. Habitat	• The habitat needs of the species type that will move through a corridor should be taken into account when establishing it.
c. Shape	• An important consideration for the shape of corridors is the dispersal patterns (e.g., directional vs. random) of the species that will be using them. • To increase the probability that animals will locate corridors, they should be designed to have a funnel shape at either end, to maximize the contact surface between the core and the corridor.
d. Length	• If an individual cannot travel through a corridor within one activity period, the corridor should provide appropriate habitat for the foraging requirements of the species, and in some cases for breeding or hibernating requirements as well.
e. Width	• Recommendations for corridor width depend on the landscape matrix and species context. • Approaches for determining appropriate corridor widths can include the following: – Noss (1992) suggests that long corridors (more than 16 kilometres [km]) should be at least 1.6 km wide and that shorter corridors be at least three times the measurable "edge effects." Using Noss's criterion, this translates into 300 metre (m) wide corridors. – Environment Canada et al. (1998) suggest corridor widths from 50 m for generalist species (i.e., white-tailed deer, raccoon) up to 500 m in rural areas for species that require interior forest habitat.

HABITAT DIVERSITY AND COMPLEXITY

- Natural areas (or clusters of areas) that span a range of topographic, soil and moisture conditions tend to contain a wider variety of plant species and plant communities, and may also support a greater diversity of ecological processes.

SPECIES DIVERSITY

- Areas that contain a high diversity of plant and animal species are generally more important than areas that contain a lower diversity of species.

SPECIES RARITY

- In general, habitats that contain rare species are more valuable than habitats that do not.
- Rarity is relative and can be described in five different ways: (1) species that are scarce but occur over a wide geographical area; (2) species that inhabit only one place; (3) species that are geographically separated from their main range; (4) species that are at the edge of their geographical range; and (5) declining species that were once more abundant and/or widespread but are now depleted.

(continued on next page)

Quick Links

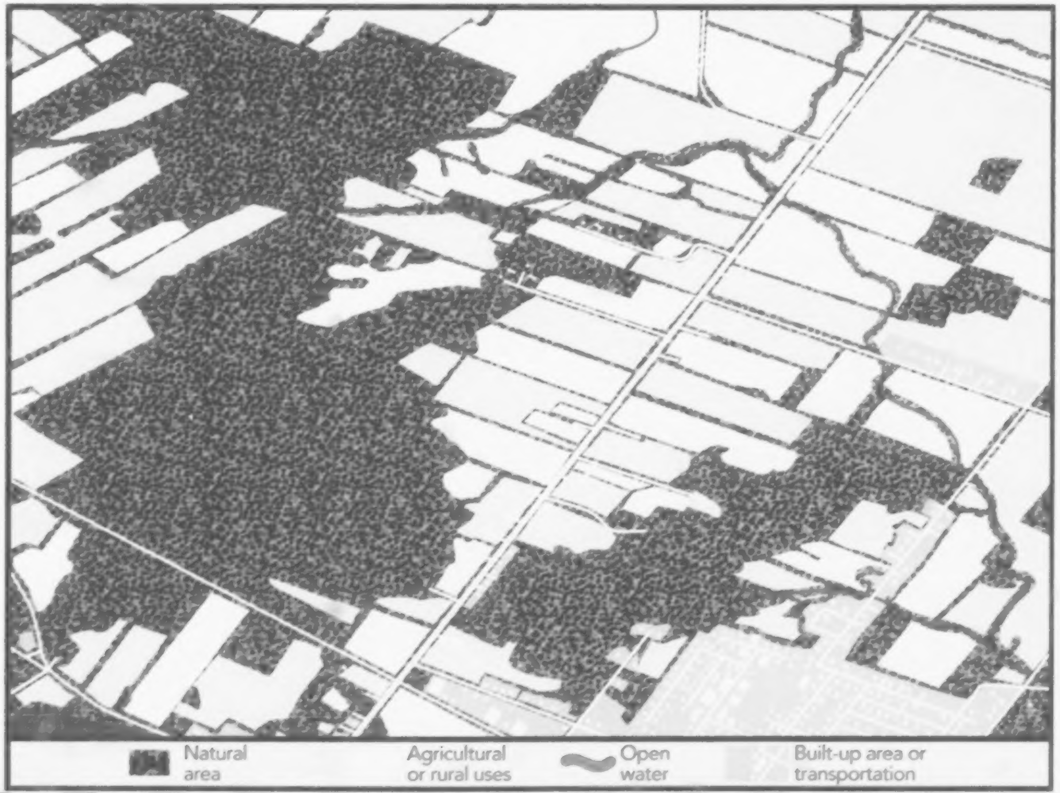
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 3-4 *(continued from previous page)*

NATURALNESS AND DISTURBANCE
• Relatively undisturbed natural areas are generally more desirable than highly altered areas.
HYDROLOGICAL AND RELATED VALUES
• Waterbodies, including wetlands, often represent a relatively small percentage of the total land area, yet they can be disproportionately more valuable than other areas. • It is recommended that measures be taken to protect water features, wetlands and other areas of hydrological importance (e.g., headwaters, recharge areas, discharge areas) within natural heritage systems.

Figure 3-3 provides a series of landscape-level illustrations that show some of these ecological function concepts and highlights some of the important things to consider when developing a natural heritage system to promote ecological integrity.

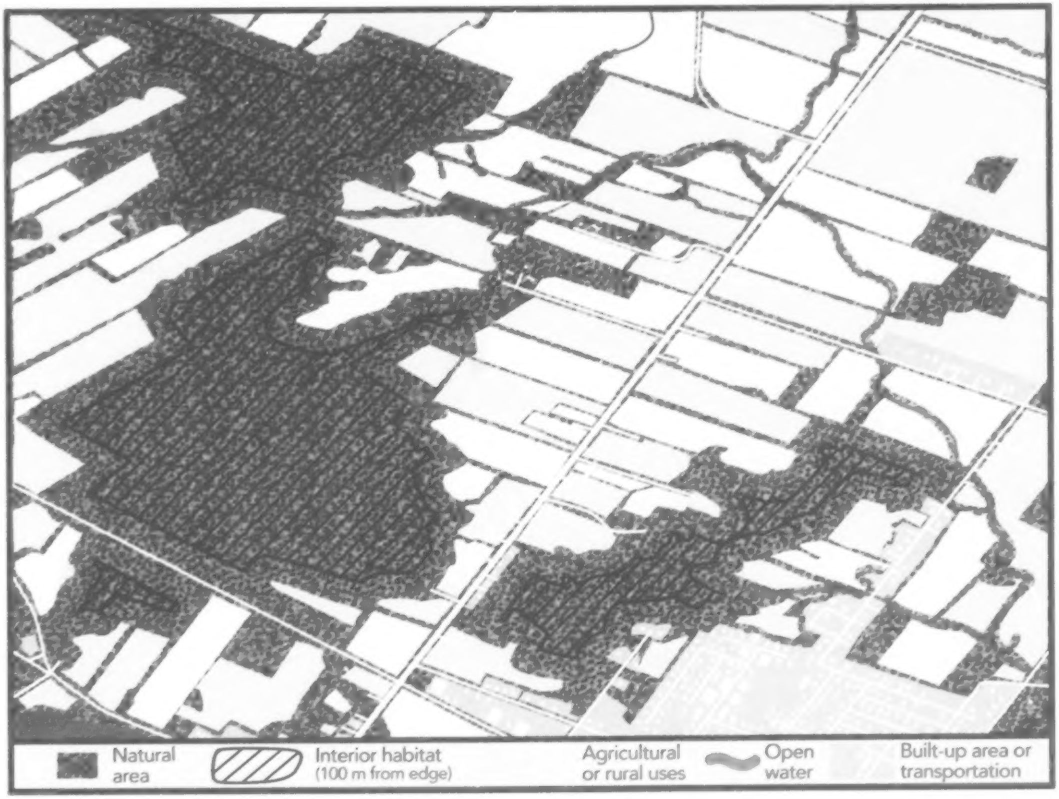
Figure 3-3: Considering Natural Heritage System Ecological Functioning and Integrity
A. Example Landscape for Considering Ecological Functioning and Integrity



Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Figure 3-3: Considering Natural Heritage System Ecological Functioning and Integrity
B. Identifying Interior Habitat for Considering Ecological Functioning and Integrity


Natural area
Interior habitat (100 m from edge)
Agricultural or rural uses
Open water
Built-up area or transportation

To have ecological integrity, a natural heritage system should include the area required for natural features and ecological functions to be maintained. Thus, lands of sufficient and appropriate width to prevent or mitigate negative impacts on natural features should be included in natural heritage systems (mitigation considerations are discussed in section 13 and appendix C). Planning authorities may need to predetermine widths of such lands for coarse-scale natural heritage systems, while at finer scales studies may determine specific distances to be used.

Ecological integrity can be promoted by having progressively less intensive land uses as proximity to a natural heritage system increases and by considering restoration opportunities and potential. For example, areas may be included because their restoration would improve connectivity between and among adjacent ecosystems and ecological features, and/or would maximize the ecological integrity of core areas. The latter would be accomplished by enlarging cores, combining core areas or adding peripheral areas to reduce the edge-to-interior ratio of cores. Mineral aggregate extraction may be appropriate in proximity to natural heritage systems where rehabilitation plans could be designed to add to the natural heritage system.

Ecological integrity is best assessed and understood at a landscape scale, but efforts applied at a smaller scale are also valuable.

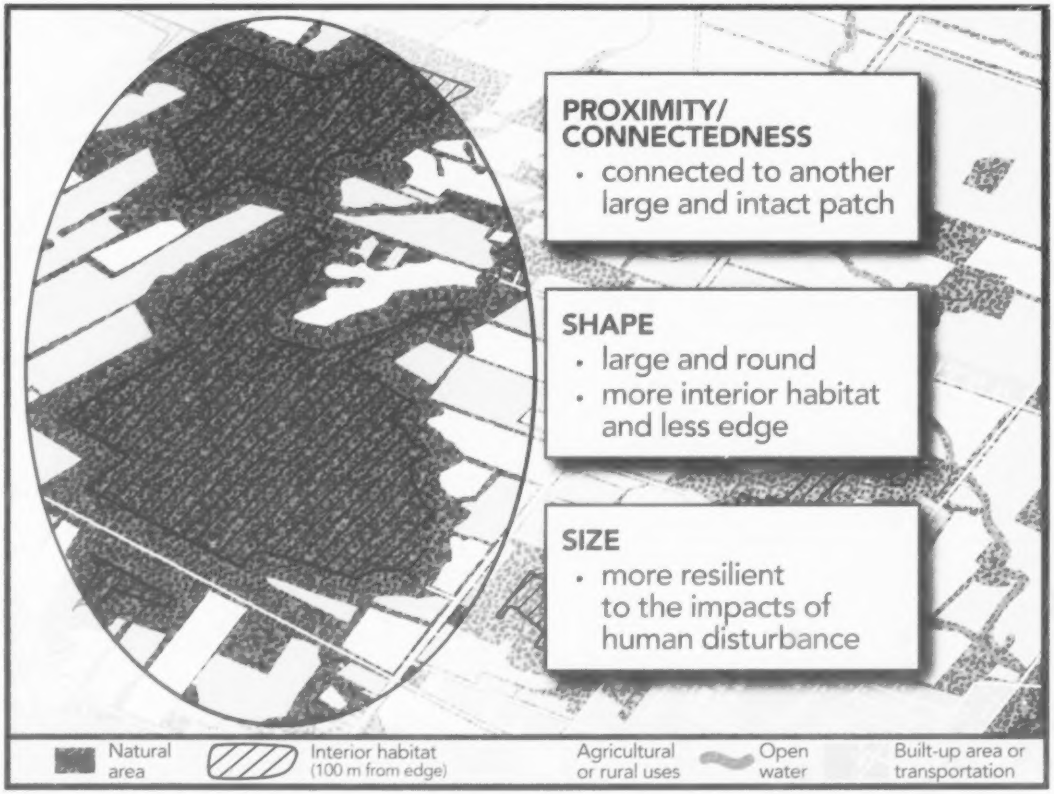
3.4.3.1 Water Resources

Surface- and groundwater features and hydrological functions should be considered in a systems approach to land use planning as per policy 2.2 of the PPS. This can be achieved by a separate analysis of water resources systems, but the relationship of these resources to natural heritage should be factored into natural heritage system design. Recommended factors to consider include the following:

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

- The surfacewater catchments of wetlands required to maintain a critical feature, species and/or function, including the existing water balance:
  - In some cases, the function may be provided through means other than inclusion of the catchments in a natural heritage system, such as innovative stormwater management. From the perspective of natural heritage, however, the inclusion of the natural catchments is preferable, since natural conditions (e.g., duration, magnitude and frequency of runoff events) cannot all be accurately duplicated in engineered systems.
- Areas where natural heritage features and groundwater conditions are connected:
  - Seeps and areas where there may be shallow groundwater movement that eventually feeds springs need to be protected, either by inclusion within the natural heritage system or by recognizing and accommodating the function within proposed land use changes.
- Sensitive features/vulnerable areas:[13]
  - Land that contains groundwater or surfacewater features that are "sensitive" or "vulnerable" and/or identified as a "designated vulnerable area" as defined in the PPS, should be included in the natural heritage system.

Figure 3-3: Considering Natural Heritage System Ecological Functioning and Integrity
C. Preferred Patch Attributes for Considering Ecological Functioning and Integrity


PROXIMITY/ CONNECTEDNESS
• connected to another large and intact patch
SHAPE
• large and round
• more interior habitat and less edge
SIZE
• more resilient to the impacts of human disturbance
Natural area
Interior habitat (100 m from edge)
Agricultural or rural uses
Open water
Built-up area or transportation

3.4.3.2 Other Ecosystem-Related Functions

Other ecological functions may be important additional considerations when identifying lands to be included within natural heritage systems. Recommended factors to consider include the following:

- Natural disturbance regimes:
  - Where possible, core areas should be identified that are large and intact enough to be resilient to typical natural disturbances such as fire, blowdown, ice storms, insects and floods.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

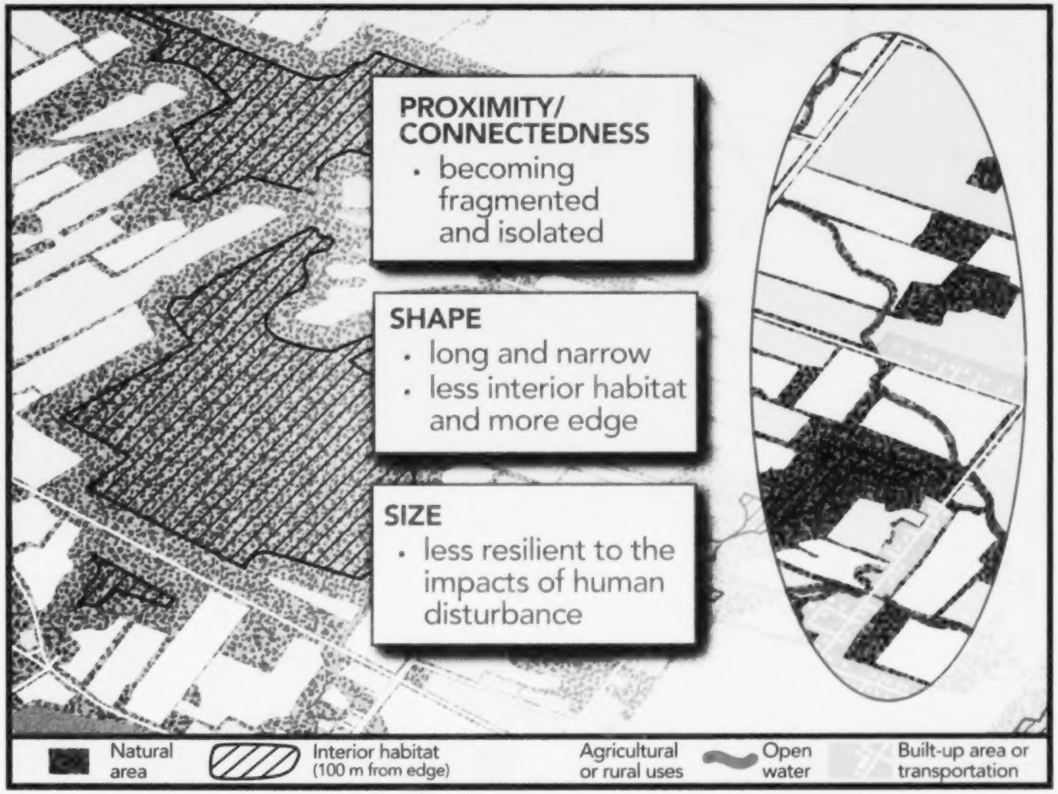
[13] Sensitive features/vulnerable areas will be addressed on completion of drinking-water source protection plans, as defined and described by the Clean Water Act, 2006

- Floodplains and dynamic beaches:
  - Shorelines and riparian areas can provide important linkage functions in a natural heritage system. Many of these are areas of natural hazards such as dynamic beaches and floodways where development is not permitted. Their inclusion in natural heritage systems would be good ecosystem-based planning.[14]

3.4.4 Building on Existing Natural Heritage System Work

The holistic, function-oriented approach characterized in the preceding sections does not invalidate planning work to date. In fact, some official plans already have natural heritage systems designations and policies that reflect most or all of what is advocated in this manual. Natural heritage systems already identified in official plans, however, may need to be evaluated for completeness. Where some attributes are missing from the original analysis (e.g., linkages between wetlands and uplands, diversity of habitats), it may be advantageous to build on the original work rather than start over. Similarly, where planning to date has focused on the protection of individual natural heritage features and areas, these may be used as a starting point for identifying what needs to be added to establish a complete system.

Figure 3-3: Considering Natural Heritage System Ecological Functioning and Integrity
D. Less Preferred Patch Attributes for Considering Ecological Functioning and Integrity


PROXIMITY/ CONNECTEDNESS
• becoming fragmented and isolated
SHAPE
• long and narrow
• less interior habitat and more edge
SIZE
• less resilient to the impacts of human disturbance
Natural area
Interior habitat (100 m from edge)
Agricultural or rural uses
Open water
Built-up area or transportation

Science and knowledge of systems have grown, and technology for obtaining and analyzing data has changed. These things have influenced and will continue to influence the delineation of systems over time. Municipalities that have systems in place should assess whether the delineated systems are achieving their objectives in successive planning cycles and respond accordingly, especially with regard to the potential impacts of climate change.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

[14] Inclusion of floodplains in natural heritage systems will not always be appropriate ecosystem-based planning. For instance, special policy areas existing in floodplains may be developed areas and not appropriate as part of a natural system.

3.4.5 Natural Heritage Systems in Agricultural Areas

Agricultural lands can be important areas for developing natural heritage systems, particularly in fragmented landscapes. Farmland in a rural area may function to some extent as a linkage between natural features, or at least it may not impede the movement of many species. This farmland area could be included in its present form within a natural heritage system and remain that way for as long as the agricultural use remains. If in the future the area undergoes a comprehensive review and it is determined that the area is to be included in a settlement area (as provided in policy 1.1.3.9 of the PPS), then its role as a linkage should be recognized appropriately. Coordinated planning for prime agricultural areas and agricultural uses, along with natural heritage systems, can prevent a change in land use from agriculture to another use that would impede or eliminate the linkage's ecological function.

The PPS definition for "natural heritage system" means that areas with the potential to be restored can be components of a system. Such lands may be agricultural areas that, with the participation of willing farmers, have the potential to contribute to restoring or improving ecological function. Stewardship that farmers provide has produced excellent examples of the maintenance, restoration and improvement of natural heritage systems. The inclusion of potential restoration areas should not be used to diminish the importance of maintaining existing natural corridors.

When developing land use planning policies for natural heritage systems within prime agricultural areas, municipalities need to ensure that agricultural uses and activities are permitted in appropriate locations. It is a common municipal practice to use an overlay approach in the official plan to identify natural heritage systems, features and areas within prime agricultural areas, provided that the full range of permitted uses, as provided in policies 2.3.3.1 and 2.3.3.2 of the PPS, would be permitted in the prime agricultural areas. The natural heritage policies associated with the overlay information or the dual designation would need to be taken into account when land use proposals and approvals are being considered. The identification of linkages in agricultural areas would indicate an intention for both interests to be achieved in the working landscape, for example, through good farm practices and stewardship.

3.4.6 Natural Heritage Systems in Settlement Areas

Natural heritage systems exist at varying scales from large, inter-regional systems thousands of hectares in size to local systems identified on a lower-tier municipal basis. For settlement areas, as defined by the PPS, there can be some unique considerations in planning for natural heritage systems. The considerations differ for existing built-up areas and for other parts of settlement areas designated to be built up in the future. Nonetheless, consideration should be given to how a natural heritage system in a settlement area relates to the larger regional context, to ensure that the natural heritage system is not being identified in isolation of what may be occurring beyond the settlement area boundary.

The extent and size of a natural heritage system is dictated by the landscape. For areas with many, large and/or significant natural heritage features, a large proportion of the land base may be required to achieve conservation goals and objectives.

Other landscapes may have fewer, smaller and/or less significant natural heritage features, and the resulting natural heritage system will probably be less extensive. Because of this, it is not possible to set predetermined targets for the size and extent (e.g., percentage of land base) of a natural heritage system. The size and extent of a natural heritage system should be determined through a comprehensive planning process.

3.4.6.1 Existing Built-up Areas

In existing built-up areas, ecosystems have tended to become degraded and divided, leaving component parts – that is, natural heritage features and areas – increasingly isolated due to their enclosure by surrounding urban land uses. Once an area is built up, opportunities to design a connected natural heritage system are considerably reduced. In such situations, while a natural feature or area may be retained, the functions that the feature or area performs may become impaired. Efforts in such cases should concentrate on protecting the remaining significant features and their functions and connecting features or improving them wherever possible, through redevelopment and infilling opportunities, rehabilitation of existing open areas or other land stewardship opportunities, as may be appropriate.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The possibilities for integration with other natural heritage systems within the planning area or in an adjacent jurisdiction also should be considered. Redevelopment projects also can be used to increase the separation distance of some urban land uses from a natural feature or area in order to lessen the impacts of development.

3.4.6.2 Designated Growth Areas

"Designated growth areas," as defined by the PPS, are "lands within settlement areas designated in official plans for growth … but which have not yet been fully developed." These areas may be referred to as "future urban" or "urbanizing" areas in official plans. In designated growth areas, natural heritage systems are a key element that should be functionally integrated into the urban community. It will be necessary to consider a mix of planning interests (e.g., types of land uses, density targets, efficient road systems) that are appropriate for the planning area along with natural heritage system objectives. The intent of identifying and protecting a natural heritage system in this type of setting is to identify and protect a system of connected natural features that will retain the long-term ecological function, once development has been established around the system. The use of a systems approach can also assist in the establishment of more efficient developable blocks for the future urban area, because the natural heritage interests and other planning interests are planned for in a comprehensive manner.

As part of a comprehensive planning process, it is recommended that a preliminary natural heritage system be identified before any other planning interests are considered. This will allow an opportunity to assess the natural heritage features and ecological functions up front and to determine the best way to connect them. A preliminary natural heritage system may need to be refined later in the planning process to incorporate other planning objectives. Any refinements contemplated for the final system will need to be assessed to ensure the original natural heritage objectives are met. The integration of a natural heritage system with other planning considerations is an iterative process in which the public and decisions makers, supported by appropriate experts, develop workable and achievable plans for urbanizing areas through the development of comprehensive official plan policies and land use designations.

Beginning the planning process with a natural heritage system concept that is based on an understanding of the natural features and ecological functions brings a fuller understanding to such discussions and any future direction that may need to be contemplated.[15]

Due to the proximity of people and traffic in settlement areas, natural features and areas, and linkages between and among them, may be subject to more stressors than their counterparts in rural areas. This makes it important to include lands within a natural heritage system that will help to maintain its long-term ecological function and biodiversity.

Including adjacent lands that maintain ecological function when developing a natural heritage system in the designated growth area could satisfy the need to demonstrate "no negative impacts," as required (as per policy 2.1.6 of the PPS) as part of a future proposed development adjacent to the protected natural heritage features and areas. Thus, the municipality would provide greater certainty about the extent of developable land earlier in the planning process, and the development proponent would not be required to complete an EIS or equivalent study to demonstrate no negative impacts (see section 4.4).

Some examples of approaches to planning for natural heritage systems in urbanizing areas include the Central Pickering Development Plan and the North Oakville Secondary Plan. Every natural heritage system, however, will be different. There is no minimum size for a system or minimum percentage of a planning area or its natural features that must be included in the system. Therefore, the extent of the natural heritage systems identified in the noted examples represents what was appropriate and achievable in those situations.[16] Those plans should be viewed as examples of the concepts, approaches and processes that could be applied in other urbanizing situations, rather than as providing standards that must always be met.

---

[15] In "designated growth areas" under the PPS, natural heritage systems being finalized for implementation in definitive ways in planning documents may be reduced (e.g., corridors and linkages may be narrowed) from the preliminary system to accommodate other planning interests.

[16] It should also be recognized that the Central Pickering Development Plan has a different policy context in that it is a provincial plan.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Once a final natural heritage system has been identified, it should be designated and zoned in municipal documents. Because development is expected to occupy most other lands, natural heritage systems in designated growth areas, in contrast to such systems in non-settlement areas, may need to be implemented with more prescriptive or restrictive land use designations and zones. Permitted uses in such a natural heritage system should be limited to those that support low-impact activities (e.g., walking, nature study, conservation).

The approach described in the preceding paragraph needs to arise from planning for all provincial interests in a comprehensive manner.[17] Further, the implementation of the prescriptive or restrictive approaches for natural heritage systems in planning documents may enable the planning authority to consider that the overall protection of natural heritage features and areas in the designated growth area would be achieved.[18]

It is also recognized that roads and other linear infrastructure (such as sewer and water pipes) may need to cross the natural heritage system to ensure an efficient urban community as approved through an environmental assessment process, for example. These types of linear infrastructure crossings should be kept to a minimum and incorporate suitable design and mitigation measures (e.g., provide appropriate wildlife crossings/passages, which would also assist in minimizing human–wildlife conflicts – see appendix C.1) to maintain linkages between and among natural heritage features.

3.4.6.3 Cultural Heritage Resources

Within settlement areas, natural heritage systems may interact more with cultural heritage or human-made features described in policy 2.6 of the PPS, such as heritage buildings, ruins, cemeteries and heritage conservation districts existing within a larger natural park, ravine or valleyland. The municipality may have listed or designated such culture-related sites under the Ontario Heritage Act or recognized them in an official plan. Even though these may exist within a larger protected natural heritage system, efforts should be made to fully understand the cultural heritage value or interest of these sites and their specific conservation requirements.

---

[17] Clarity in the official plan can assist with land budgeting exercises, where applicable, so areas with planning protection related to natural heritage may be netted out of the calculations.

[18] The presence of known significant natural heritage features and areas outside the final natural heritage system would also need to be considered, along with expert advice.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

4.0 NATURAL HERITAGE FEATURES AND AREAS

4.1 Introduction

The PPS identifies a set of natural heritage features and areas that are afforded various levels of protection when development or site alteration is being contemplated in or adjacent to these resources. Section 4 discusses the meaning of "significant" in relation to natural heritage features and areas, the need to consider "adjacent lands" to natural heritage features and areas, and the area-specific variations to policy. Sections 5 to 11 describe each of the natural heritage features and areas identified in policies 2.1.3, 2.1.4, and 2.1.5 of the PPS.

Natural heritage features and areas: means features and areas, including *significant wetlands, significant coastal wetlands, fish habitat, significant woodlands* south and east of the Canadian Shield, *significant valleylands* south and east of the Canadian Shield, *significant* habitat of *endangered species* and *threatened species, significant wildlife habitat,* and *significant areas of natural and scientific interest,* which are important for their environmental and social values as a legacy of the natural landscapes of an area.

Provincial Policy Statement 2005, Section 6.0 Definitions
Italics indicate terms defined in the PPS

Background information, including the definitions from the PPS and an overview of benefits and values is provided for each natural heritage feature and area. In addition, a summary of recommended identification and evaluation procedures is provided. Recommendations for adjacent lands are also provided along with information sources for each natural heritage feature and area (see appendix B). The suggested information sources are not intended to be exhaustive. Additional information sources may have to be consulted for further detailed information on a particular natural heritage feature or area.

Note:

When two or more types of natural heritage features or areas coincide, the stronger policy protection provided in the PPS and described in the manual will prevail. For example, if a significant wetland occurs within a significant woodland, "no development and site alteration" would be allowed in either the wetland or woodland where these features coincide (as per policy 2.1.3 of the PPS). For portions outside the significant wetland but still part of the significant woodland, the "demonstration of no negative impact" policies would apply (as per policies 2.1.4 and 2.1.6 of the PPS).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

4.2 The Meaning of "Significant"

Significant: means

a) in regard to *wetlands, coastal wetlands* and *areas of natural and scientific interest*, an area identified as provincially significant by the Ontario Ministry of Natural Resources using evaluation procedures established by the Province, as amended from time to time;

b) in regard to the habitat of *endangered species* and *threatened species*, … the habitat, as approved by the Ontario Ministry of Natural Resources, that is necessary for the maintenance, survival, and/or the recovery of naturally occurring or reintroduced populations of *endangered species* or *threatened species*, and where those areas of occurrence are occupied or habitually occupied by the species during all or any part(s) of its life cycle;

c) in regard to *woodlands*, an area which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or …the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past management history;

d) in regard to other features and areas in policy 2.1, ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or *natural heritage system*; …

Criteria for determining significance for the resources identified in sections (c)–([d]) are recommended by the Province, but municipal approaches that achieve or exceed the same objective may also be used.

While some significant resources may already be identified and inventoried by official sources, the significance of others can only be determined after evaluation.

Provincial Policy Statement 2005, Section 6.0 Definitions
Italics indicate terms defined in the PPS

With respect to the provincial interest, the concept of significance (e.g., no development or site alteration in a "significant" feature) is central to the identification and protection of all natural heritage features and areas, except fish habitat. The term "significant" is defined in section 6.0 of the PPS with specific reference to what the term means with respect to each of the natural heritage features and areas in policy 2.1.

The definition for "significant" also states, "While some significant resources may already be identified and inventoried by official sources, the significance of others can only be determined after evaluation."

This statement identifies the need for a precautionary approach. Thus, prior to planning and development approval, there should be an appropriate level of evaluation of natural features that are present on the subject land and within the area that may constitute "adjacent lands" (see section 4.4) to determine whether the natural features are significant if their significance has not been determined previously. Planning authorities and/or proponents should require or prepare the appropriate studies if negative impacts could occur on these features, unless the features are being given protection outright.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

4.2.1 Identification and Evaluation of Significant Features and Areas

The identification and evaluation of significant features and areas, at provincial, regional and local scales, are important both to the development of planning documents and to the assessment of possible impacts of proposed development or site alteration on the natural features or the ecological functions for which an area is identified (see section 13). In the case of wetlands, coastal wetlands and areas of natural and scientific interest (ANSIs), the responsibility for identifying their significance lies with MNR. MNR will also approve what is to be considered as the significant habitat of endangered species and threatened species. In all other cases, the responsibility lies with the planning authority or, in the case of an appeal, the Ontario Municipal Board, to identify and/or approve the designation of significant natural heritage features and areas[19] (see table 4-1).

Access to information is an important step in the planning process for the identification and evaluation of significant features or areas. Planning authorities and proponents require timely access to relevant information as part of various planning process activities, which may include ecological site assessment, identification of known or evaluation of new significant features or areas, and assessment of potential impacts (see section 13). To support planning authorities and proponents, appendix B of the manual provides a summary of relevant available natural heritage information by PPS policy area.

Table 4-1: Where Authority Rests for Establishing the Significance of Features for the PPS[20]

FEATURE	WHO ESTABLISHES AND HOW
Significant habitat of endangered species and threatened species	MNR identifies such habitat by delineating/describing, reviewing and approving the work of others or establishing methods such as training and standards that ensure that the work of others will be acceptable.
Significant wetlands and significant coastal wetlands	MNR identifies such wetlands by delineating them or reviewing the work of others in accordance with the Ontario Wetland Evaluation System (see section 6.3.1).

(continued on next page)

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

[19] There is no intended difference in level of significance between the types of natural heritage features and areas where MNR identifies or approves these as provincially significant or significant, as the case may be, and those where municipal approaches apply to determine significance. However, there may be other features identified for protection as per PPS policy 2.1 by a planning authority that are based on criteria that go beyond those recommended by the Province, in which case PPS policy 4.6 would apply to the extent of any conflict.

[20] Fish habitat, as per PPS policy 2.1.5, is defined by the Fisheries Act, and the PPS definition for "significant" is not applied directly for identification and evaluation (see section 11.3).

Table 4-1 *(continued from previous page)*

FEATURE	WHO ESTABLISHES AND HOW
Significant woodlands	Planning authorities identify such woodlands or approve the work of others using criteria recommended in the manual or municipal approaches that achieve or exceed the same objective as the provincial criteria.
Significant valleylands	Planning authorities identify such valleylands or approve the work of others using criteria recommended in the manual or municipal approaches that achieve or exceed the same objective as the provincial criteria.
Significant wildlife habitat	Planning authorities identify such habitat or approve the work of others using criteria and processes recommended in the Significant Wildlife Habitat Technical Guide (see section 9.3.1) and the manual, or municipal approaches that achieve or exceed the same objective as the provincial processes and criteria.
Areas of natural and scientific interest	MNR identifies such areas in accordance with the ANSI confirmation process.

4.3 The Importance of Regional and Local Natural Heritage Features

Throughout the manual, there is a continuous emphasis on the concept of significance in natural heritage planning to serve the protection of provincial interests. Planning authorities may identify a feature or area as "significant" as defined by the PPS that is "ecologically important... and contributes to the quality and diversity of an identifiable geographic area or natural heritage system." Examples of geographic areas that may be supporting significant natural heritage features and areas include the following:

- the Warsaw caves and kettles in Peterborough County
- Lake Erie islands and portions of the Great Lakes shoreline
- Frontenac Axis
- limestone of the Niagara Escarpment
- Precambrian Shield on Manitoulin Island
- Clay plains or sand ridges in Ecoregion 7E (Carolinian zone)

Planning authorities may choose to use approaches that go beyond the minimum PPS natural heritage policies and criteria established by the Province, as supported by the PPS definition of "significant" and section 4.6. If their approach does not conflict with other policies of the PPS, planning authorities can adopt standards that address the protection of features deemed significant at a regional or local level. For example, a planning authority may choose to include regionally significant ANSIs as being significant in their planning policies, in addition to those that MNR has identified as provincially significant. Planning authorities may also choose to include environmentally significant or sensitive areas and/or wetlands, as identified by local conservation authorities or the planning authority in their planning documents. To assist with the identification of regionally or locally important natural heritage features, the Province provides various information sources, as detailed in appendix B.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

4.4 Adjacent Lands

"Adjacent lands" is defined in the PPS for purposes of policy 2.1 as follows:

> **Adjacent lands:** means
>
> a) for the purposes of policy 2.1, those lands contiguous to a specific *natural heritage feature or area* where it is likely that *development* or *site alteration* would have a *negative impact* on the feature or area. The extent of the *adjacent lands* may be recommended by the Province or based on municipal approaches which achieve the same objectives; …
>
> **Provincial Policy Statement 2005, Section 6.0 Definitions**
> *Italics indicate terms further defined in the PPS*

Policy 2.1.6 of the PPS provides the policy direction for consideration of the impacts of development and site alteration within adjacent lands for natural heritage features and areas specified in policies 2.1.3, 2.1.4 and 2.1.5.

> *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4 and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions.*
>
> **Provincial Policy Statement 2005, policy 2.1.6**
> *Italics indicate terms further defined in the PPS*

The PPS directs that development or site alteration is not permitted on adjacent lands unless the ecological function of the adjacent lands has been evaluated and it can be demonstrated (through an EIS or equivalent study) that there will be no negative impacts on the natural features or their ecological functions. The evaluation of ecological function of adjacent lands through an EIS or equivalent study should be undertaken by a qualified professional as appropriate to the scale of development and the potential for negative impacts (see section 4.4.2.1 and section 13.4).

The need to evaluate the ecological function of adjacent lands (i.e., undertake an EIS or equivalent study) would be removed if proponents choose to avoid having development and site alteration occur within the extent of adjacent lands.

Policy 2.1.6 of the PPS will necessitate that further study be undertaken if adjacent lands are not avoided, unless the planning authority is satisfied that an EIS is not warranted due to specific circumstances, as further discussed below. The subsequent EIS then determines the extent of impacts (if any) and recommends appropriate changes to an application, identifies any no development/protection zones (also referred to as setbacks or buffers – see section 4.5) to be implemented and/or proposes other mitigation (see appendix C) that would be necessary to avoid negative impacts on the features or their ecological functions.

4.4.1 Provincial Recommendations for the Extent of Adjacent Lands

The purpose of identifying the extent of adjacent lands is to establish the area in which potential impacts from a proposed change in land use might occur. Understanding of the potential impacts associated with development and of the wildlife habitat requirements of sensitive species has improved since the 1999 manual was written. Since the release of the 1999 manual, new scientific research focusing on the potential impacts that development has on wildlife has improved the state of ecological knowledge. Researchers' and organizations' recommendations about the distances from development which a feature's ecological functions may be affected can exceed 500 metres, depending on the species that uses those lands (Environment Canada, 2004).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The Province's recommended distances for defining adjacent lands provided in the manual[21] (see table 4-2) are drawn from these various scientific studies and are an attempt to balance the range of research showing that the impacts of development extend beyond the distances recommended in the 1999 manual.

The Province's recommendations are based on a review of current scientific research that includes studies covering topics such as the sensitivity of species to disturbance, the habitat requirements of species and the extent of the influence of development and site alteration on species (see section 16 for an annotated bibliography of scientific resources and recommendations on adjacent lands).

When there is doubt concerning the potential for negative impacts, the adjacent lands widths recommended in the manual (or greater ones, as discussed below) should be adopted and an EIS or other equivalent study be undertaken to determine the extent of impacts, the appropriateness of the proposed land use change, and mitigation if proceeding while being consistent with policy 2.1.6 of the PPS is possible.

Table 4-2 summarizes provincial recommendations regarding the extent of adjacent lands for evaluating ecological function and determining negative impacts on natural heritage features or areas, as per policy 2.1.6 of the PPS, and provides links to the relevant section of the manual.

Table 4-2: Provincial Recommendations for Adjacent Lands Widths for PPS Policy 2.1.6

PPS NATURAL HERITAGE FEATURE OR AREA	ADJACENT LANDS WIDTH (distance from feature for considering potential negative impacts)	MANUAL LOCATION FOR FURTHER DISCUSSION
Significant habitat of endangered and threatened species	120 m	section 5.4
Significant wetlands and significant coastal wetlands	120 m	section 6.4
Significant woodlands	120 m	section 7.4
Significant valleylands	120 m	section 7.4
Significant wildlife habitat	120 m	section 9.4
Significant areas of natural and scientific interest – life science	120 m	section 10.4
Significant areas of natural and scientific interest – earth science	50 m	section 10.4
Fish habitat	inland lake trout lake (at capacity) on the Canadian Shield 300 m all other fish habitat 120 m	section 11.4

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

[21] The Lakeshore Capacity Assessment Handbook (see section 15 to access an electronic copy) also should be followed for inland lakes and associated watercourses on the Canadian Shield and would prevail where its guidance is more detailed than or differs from the guidance in this manual.

4.4.2 Developing Municipal Approaches for Determining the Extent of Adjacent Lands

Consistent with the definition of "adjacent lands" in the PPS, as provided above, planning authorities may choose other approaches as long as they demonstrate that no negative impacts on the natural features or their ecological functions will occur. It is of paramount importance, however, that planning authorities' approaches not exempt development proposals from a rigorous EIS or other study where one is warranted.

If planning authorities wish to use a smaller adjacent lands width as a site-specific alternative to the widths recommended in the manual, they need to be confident that the application in question cannot produce a negative impact on a significant natural feature or its ecological functions from beyond the proposed adjacent lands width. Similarly, if planning authorities wish to define certain areas of their jurisdiction (e.g., existing built up areas) for alternative adjacent lands widths, they need to be confident that the range of permitted uses, the natural heritage characteristics of the area, the existing development pattern and other factors will ensure that there will be no negative impacts, as defined in the PPS, beyond the proposed adjacent lands width. Municipalities may want to undertake a comprehensive study to support potential changes to adjacent lands widths.

In some situations, depending on species or habitat sensitivity, site characteristics and/or intensity of development or site alteration, the area in which studies should take place (i.e., the adjacent lands) may need to be greater than the minimum distance recommended in this manual. For example, the habitat requirements of snake species (e.g., massasauga, eastern hognose, eastern ratsnake) are poorly known, and they may require much larger areas than is generally thought. Radio-tagging studies of eastern ratsnake demonstrated that these animals often move considerable distances among key habitats within their home range.

In cases where there is doubt as to whether a particular application may affect a feature or its functions, a precautionary approach should be taken in defining adjacent lands. In such cases, planning authorities may wish to recommend an appropriate level of study (see section 13.4) to determine the need for a full EIS over a greater distance.

4.4.2.1 Tailoring Adjacent Lands Studies to the Situation

A planning authority may choose to tailor its requirements regarding the appropriate level of effort for an adjacent lands study (i.e., EIS or equivalent study) to take into account existing development, existing land use entitlements and the existing land use fabric.

For example, in some cases, if intervening development already exists within the manual-recommended adjacent lands widths, the demonstration of no negative impacts can be a simple statement in a planning report that negative impacts are not anticipated (see figure 4-1). Proposals for small intrusions into adjacent lands requiring a Planning Act approval (e.g., minor variance) may be treated in the same way. Again, development proponents should not be exempted from undertaking a rigorous EIS or other study where one is warranted.

Section 13 provides a detailed discussion of how to assess and address the impacts of development and site alteration.

Quick Links

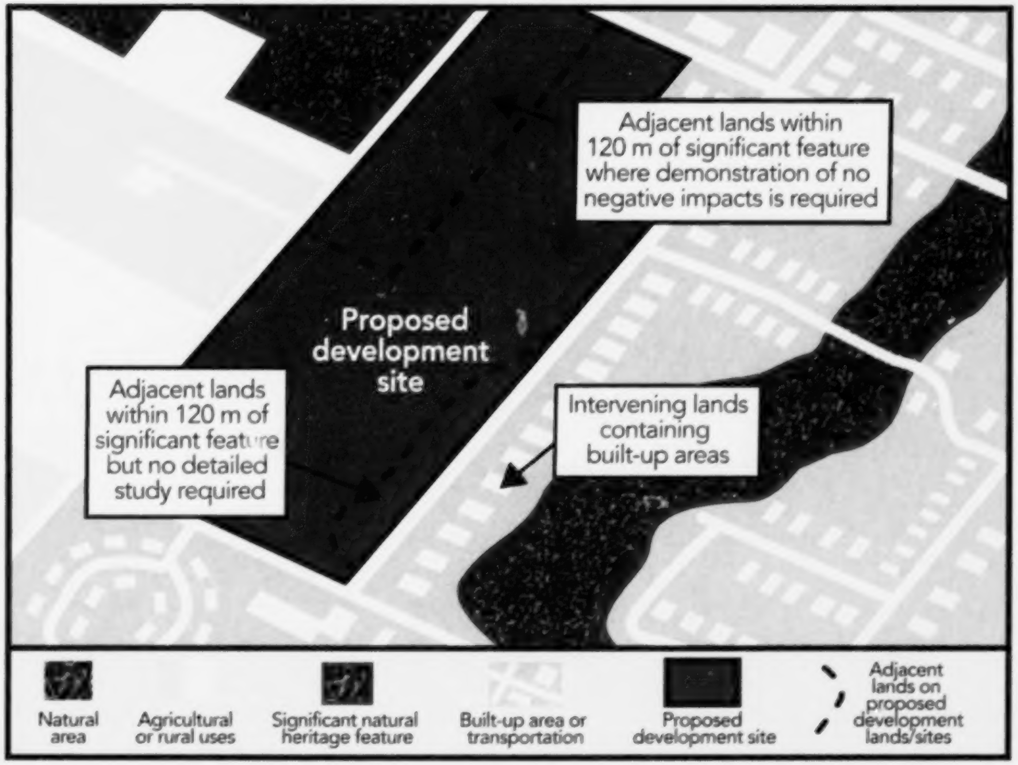
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

4.5 Relationship between Adjacent Lands and Buffers

Adjacent lands are not synonymous with buffers.[22] As described above, if development and site alteration are proposed to occur within the adjacent lands of features specified in policies 2.1.3, 2.1.4 and 2.1.5 of the PPS, then it must be demonstrated that there will be no negative impacts on the natural features or their ecological functions. As part of demonstrating that there will be no negative impacts, areas may be identified within the adjacent lands as potential areas that will be set aside (left in a natural vegetated state) to mitigate the predicted impacts of an undertaking. The areas to be set aside are often referred to as "setbacks" or "buffers."

In contrast to adjacent lands, which are usually established before development is proposed (e.g., through official plan and or zoning by-law provisions), identified buffers should be determined once the nature of the development is known and the extent of potential impacts can be determined.

Figure 4-1: Example of Tailoring an Adjacent Lands Study


Adjacent lands within 120 m of significant feature where demonstration of no negative impacts is required
Proposed development site
Adjacent lands within 120 m of significant feature but no detailed study required
Intervening lands containing built-up areas
Natural area
Agricultural or rural uses
Significant natural heritage feature
Built-up area or transportation
Proposed development site
Adjacent lands on proposed development lands/sites

Thus, buffers needed to ensure no negative impacts should be determined as part of the following studies or planning processes:

- an EIS or equivalent study by a proponent and approved by the planning authority
- a secondary plan or development approval process
- a comprehensive study
- a subwatershed study

---

[22] Buffers are referred to as "vegetation protection zones" in the ORMCP, the Greenbelt Plan and the Lake Simcoe Protection Plan, and these provincial plans contain specific policy direction that applies to such zones.

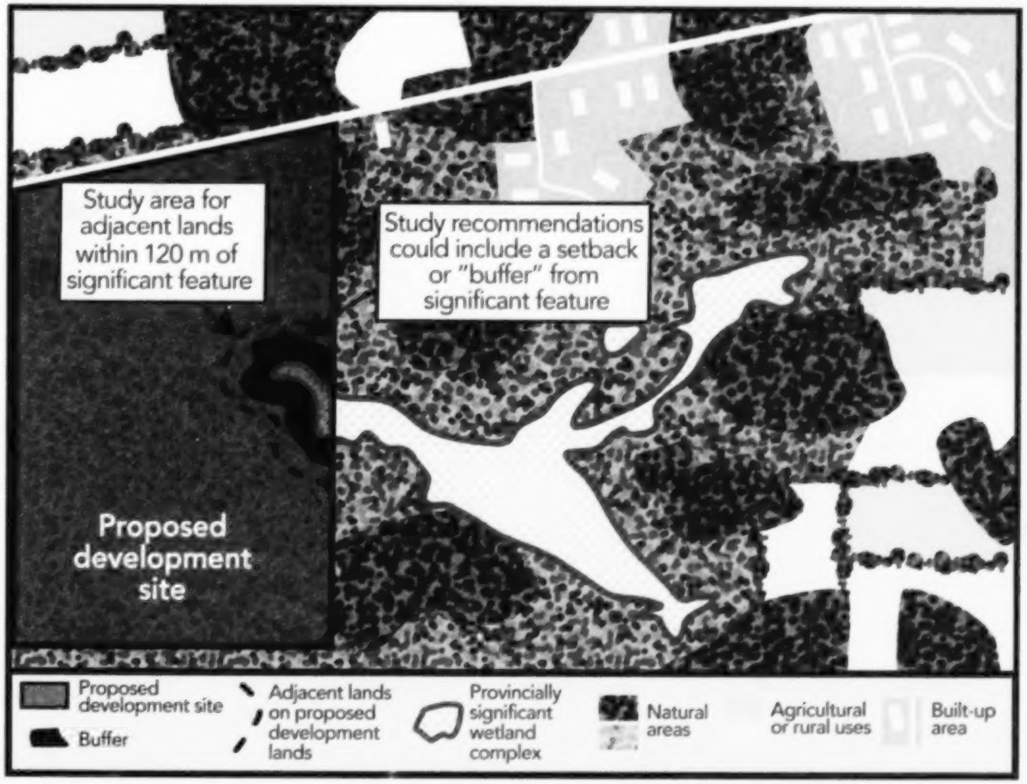
Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

If studies determine that development anywhere within the adjacent lands will have a negative impact on natural features and their functions, buffers identified to mitigate these impacts could include the entire adjacent lands. As noted above, in certain circumstances the adjacent lands width will need to be expanded beyond the recommendations provided in the manual, and there may be cases in which those expanded adjacent land widths will require a buffer to cover the entire area. Guidance on applying buffers, as one of several mitigation approaches, and their appropriate widths is provided in section 13.5.4.2, section 16 and appendix C.1.2.

Figure 4-2 provides an example of adjacent lands for a natural heritage feature and how a potential buffer could be applied.

Figure 4-2: Illustration of the Relationship between Adjacent Lands and Buffers


Study area for adjacent lands within 120 m of significant feature
Study recommendations could include a setback or "buffer" from significant feature
Proposed development site
Proposed development site
Buffer
Adjacent lands on proposed development lands
Provincially significant wetland complex
Natural areas
Agricultural or rural uses
Built-up area

4.6 Area-Specific Policy

4.6.1 Canadian Shield Line

Figure 4-3 depicts the line used to identify lands situated south and east of the Canadian Shield. As identified in the PPS, "lands to the south and east of the Canadian Shield" means lands lying south and east of the southern boundary of the Precambrian Shield excluding Manitoulin Island. The Canadian Shield line applies to significant woodlands and valleylands. The PPS policies on significant woodlands and significant valleylands apply only to the natural heritage areas situated south and east of the Canadian Shield. Planning authorities north of the Canadian Shield boundary, however, may also develop policies that protect these natural heritage features and areas.

Quick Links

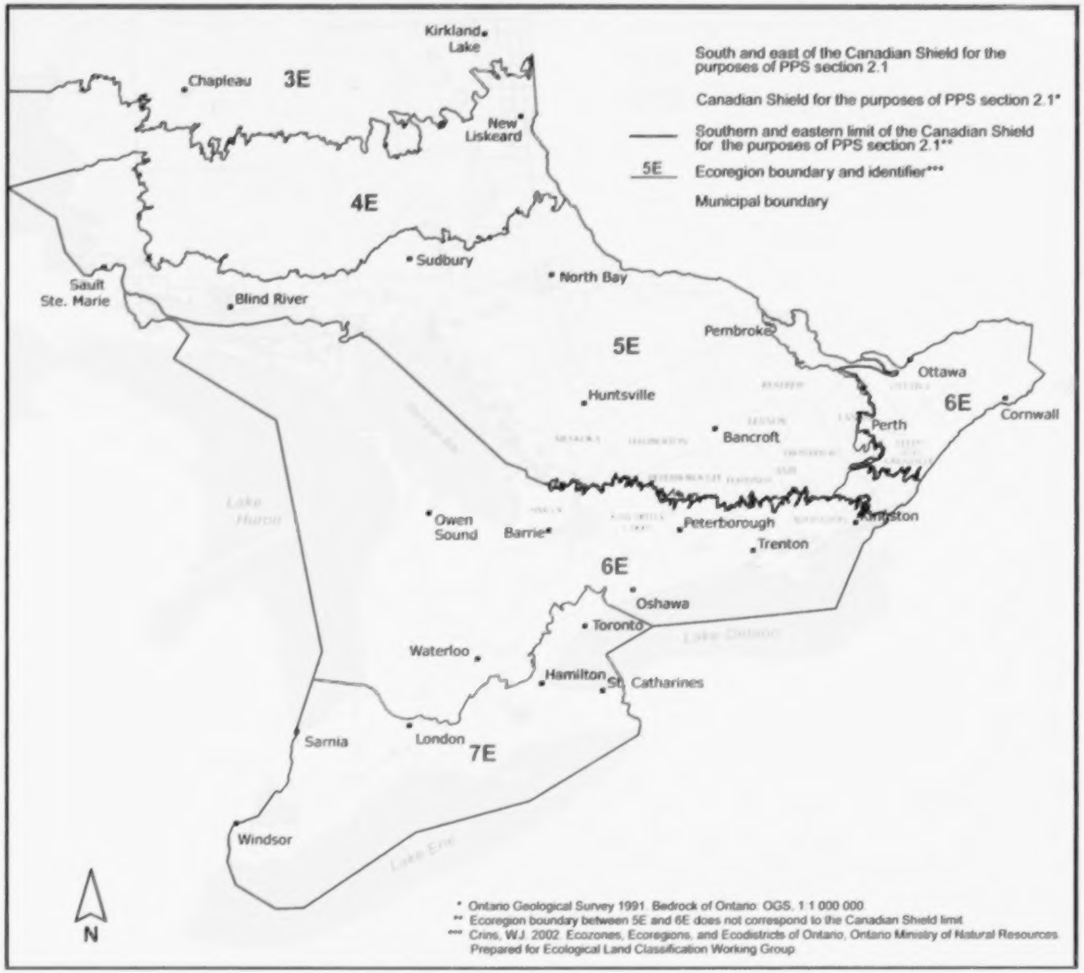
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

4.6.2 Ecoregion Line

For wetlands, the northernmost limit of Ecoregion 5E marks the boundary between the lands subject to the "no development" PPS policy (policy 2.1.3) and those subject to the "conditional development" PPS policy (policy 2.1.4). There is an exception to the no development policy for significant wetlands in Ecoregion 5E. As outlined in the definition of "development" in the PPS for the purposes of policy 2.1.3(b), development does not include underground or surface mining of minerals or advanced exploration on mining lands in significant areas of mineral potential in Ecoregion 5E, where advanced exploration has the same meaning as under the Mining Act. Instead, those matters shall be subject to policy 2.1.4(a).

A planning authority may have to determine the exact location of these lines on the basis of provincial-scale information. In cases in which either line bisects a natural heritage area, the Province supports the application of the policies that apply within Ecoregions 5E, 6E and 7E, and south and east of the Canadian Shield. Detailed mapping (1:10,000 Ontario Base Map [OBM]) of these lines is available in digital format or a paper medium from MNR or, for the Canadian Shield, the Ministry of Northern Development and Mines (MNDM).

Figure 4-3: Area-Specific PPS Natural Heritage Policy – Canadian Shield and Ecoregion Line


South and east of the Canadian Shield for the purposes of PPS section 2.1
Canadian Shield for the purposes of PPS section 2.1*
Southern and eastern limit of the Canadian Shield for the purposes of PPS section 2.1**
5E Ecoregion boundary and identifier***
Municipal boundary
3E
4E
5E
6E
6E
7E
Kirkland Lake
Chapleau
New Liskeard
Sudbury
North Bay
Sault Ste. Marie
Blind River
Pembroke
Ottawa
Cornwall
Huntsville
Bancroft
Perth
Kingston
Owen Sound
Barrie
Peterborough
Trenton
Oshawa
Toronto
Waterloo
Hamilton
St. Catharines
Sarnia
London
Windsor
Lake Huron
Lake Ontario
Lake Erie
N

* Ontario Geological Survey 1991. Bedrock of Ontario. OGS, 1:1 000 000

** Ecoregion boundary between 5E and 6E does not correspond to the Canadian Shield limit

*** Crins, W.J. 2002. Ecozones, Ecoregions, and Ecodistricts of Ontario, Ontario Ministry of Natural Resources. Prepared for Ecological Land Classification Working Group

A shape file of the ecoregion boundaries is available from the Ontario Land Information Warehouse to users who have a valid user account.

Quick Links

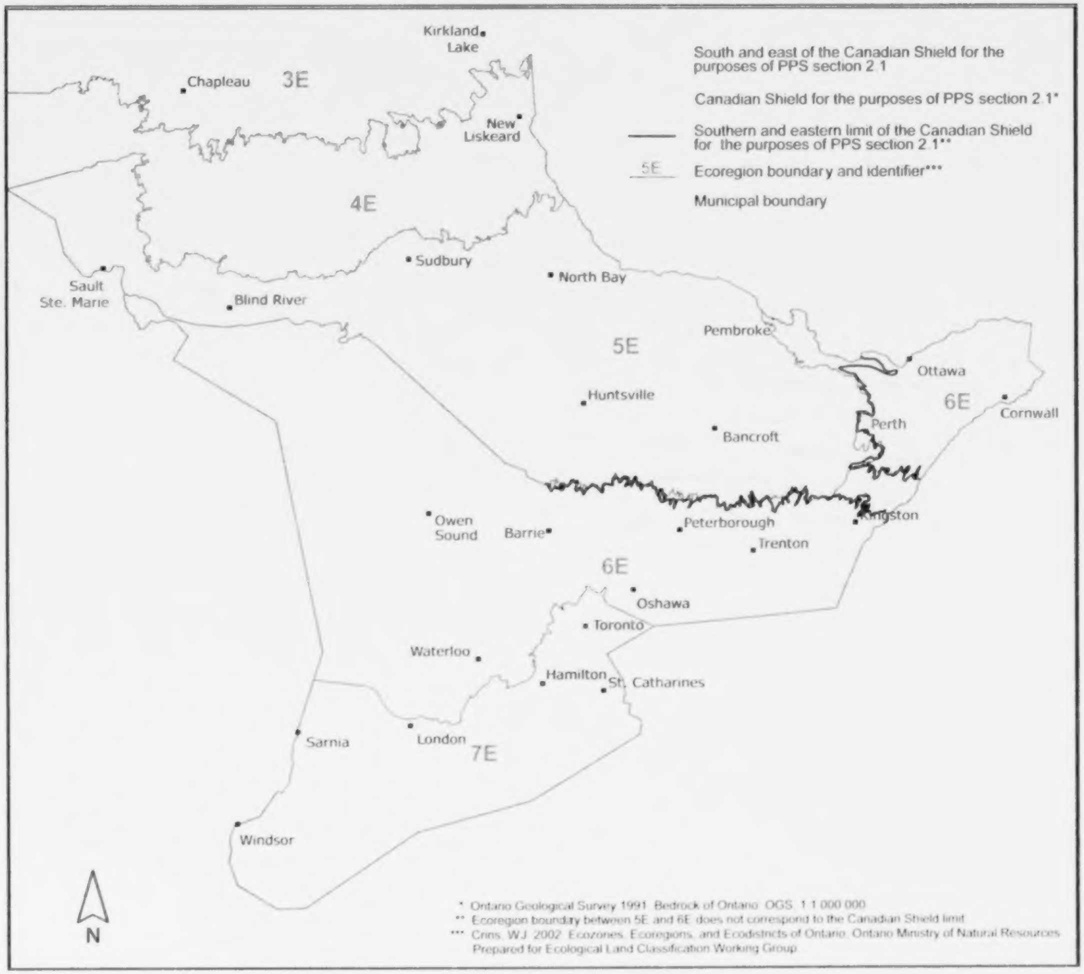
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

4.6.2 Ecoregion Line

For wetlands, the northernmost limit of Ecoregion 5E marks the boundary between the lands subject to the "no development" PPS policy (policy 2.1.3) and those subject to the "conditional development" PPS policy (policy 2.1.4). There is an exception to the no development policy for significant wetlands in Ecoregion 5E. As outlined in the definition of "development" in the PPS for the purposes of policy 2.1.3(b), development does not include underground or surface mining of minerals or advanced exploration on mining lands in significant areas of mineral potential in Ecoregion 5E, where advanced exploration has the same meaning as under the Mining Act. Instead, those matters shall be subject to policy 2.1.4(a).

A planning authority may have to determine the exact location of these lines on the basis of provincial-scale information. In cases in which either line bisects a natural heritage area, the Province supports the application of the policies that apply within Ecoregions 5E, 6E and 7E, and south and east of the Canadian Shield. Detailed mapping (1:10,000 Ontario Base Map [OBM]) of these lines is available in digital format or a paper medium from MNR or, for the Canadian Shield, the Ministry of Northern Development and Mines (MNDM).

Figure 4-3: Area-Specific PPS Natural Heritage Policy – Canadian Shield and Ecoregion Line


Kirkland Lake
Chapleau
3E
New Liskeard
4E
Sudbury
North Bay
Sault Ste. Marie
Blind River
Pembroke
5E
Ottawa
Huntsville
6E
Cornwall
Perth
Bancroft
Kingston
Owen Sound
Barrie
Peterborough
Trenton
6E
Oshawa
Toronto
Waterloo
Hamilton
St. Catharines
Sarnia
London
7E
Windsor
N
South and east of the Canadian Shield for the purposes of PPS section 2.1
Canadian Shield for the purposes of PPS section 2.1*
Southern and eastern limit of the Canadian Shield for the purposes of PPS section 2.1**
5E Ecoregion boundary and identifier***
Municipal boundary

* Ontario Geological Survey 1991. Bedrock of Ontario. OGS. 1:1 000 000

** Ecoregion boundary between 5E and 6E does not correspond to the Canadian Shield limit

*** Crins, W.J. 2002. Ecozones, Ecoregions, and Ecodistricts of Ontario. Ontario Ministry of Natural Resources. Prepared for Ecological Land Classification Working Group.

A shape file of the ecoregion boundaries is available from the Ontario Land Information Warehouse to users who have a valid user account.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 73
Significant Wildlife Habitat 83
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 95
How to Protect: Municipal Planning Techniques and Tools 100
Addressing Impacts of Development and Site Assessment 113
Preparing Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 162
Glossary 216
Works Cited 219

5.0 SIGNIFICANT HABITAT OF ENDANGERED AND THREATENED SPECIES

5.1 Policy Explanation

> 2.1.3 *Development* and *site alteration* shall not be permitted in:
>
> a) *significant* habitat of *endangered species* and *threatened species*; ...
>
> 2.1.6 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4, and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions*.
>
> **Provincial Policy Statement 2005, policy 2.1**
> *Italics indicate terms further defined in the PPS*

> **Endangered species:** means a species that is listed or categorized as an "Endangered Species" on the Ontario Ministry of Natural Resources' official species at risk list, as updated and amended from time to time.
>
> **Threatened species:** means a species that is listed or categorized as a "Threatened Species" on the Ontario Ministry of Natural Resources' official species at risk list, as updated and amended from time to time.
>
> **Significant:** means ... b) in regard to the habitat of *endangered species* and *threatened species*, means the habitat, as approved by the Ontario Ministry of Natural Resources, that is necessary for the maintenance, survival and/or recovery of naturally occurring or reintroduced populations of *endangered species* or *threatened species*, and where those areas of occurrence are occupied or habitually occupied by the species during all or any part(s) of its life cycle; ...
>
> **Provincial Policy Statement 2005, 6.0 Definitions**
> *Italics indicate terms further defined in the PPS*

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The PPS directs that no development or site alteration is permitted in significant habitat of endangered or threatened species. To be consistent with policies 2.1.3(a) and 2.1.6 of the PPS, planning authorities must sustain habitats for endangered species and threatened species, and promote the recovery of these species by:

- not permitting development and site alteration in their significant habitats; and
- not permitting development and site alteration on adjacent lands unless their ecological functions have been evaluated and it is demonstrated that there will be no negative impacts on the significant habitat or its ecological function.

The definition of "significant" as it pertains to the habitat of endangered species and threatened species has two basic characteristics that habitat must exhibit to meet the definition:

1. necessary for maintenance, survival and/or recovery of naturally occurring or reintroduced populations; and
2. occupied or habitually occupied by the species during all or any part(s) of its life cycle.

5.1.1 Relationship to the Endangered Species Act, 2007

The habitat protection requirements for endangered and threatened species contained in the PPS were not altered when the Endangered Species Act, 2007 (ESA) came into force on June 30, 2008. The PPS still provides for the proactive protection of significant habitat, as approved by MNR, of endangered species and threatened species. The habitat protection provisions for threatened and endangered species under the ESA and the PPS are very similar and are intended to work together. However, there are differences between the ESA and the PPS, some of which are explained below.

Under the ESA, no person shall damage or destroy the habitat of an endangered or threatened species. There are two definitions of "legally protected habitat" under the ESA: regulated habitat under 2(1)(a) or general habitat under 2(1)(b). Only one definition applies at any given time.

General habitat applies automatically when a species is added to or the species status is amended on the Species at Risk in Ontario (SARO) List after June 30, 2008. The area identified as significant habitat for endangered and threatened species under the PPS and the area identified as habitat using the general definition of habitat under the ESA are meant to be the same. Thus, the same area will be delineated or described when MNR staff are carrying out responsibilities to which either definition applies.

Species-specific habitat regulations under the ESA could include areas that are not identified as significant habitat of endangered species and threatened species, as defined by the PPS, or exclude areas that are so identified. As further explained below, MNR will consider what adjustments may be needed to the area of significant habitat on the basis of an assessment of an approved species-specific regulation and the need to remain consistent with the PPS definition for "significant."

The ESA includes provisions that MNR may use to balance social, economic and cultural considerations with the protection and recovery of Ontario's species at risk and their habitats. These provisions enable MNR to issue permits, agreements and regulations, under conditions specified in the ESA, that allow activities to occur (subject to other applicable approvals) that would otherwise be prohibited under the ESA. For instance, a permit could be issued to allow an activity that will destroy the habitat of an endangered or threatened species when the permit holder has agreed to offset this loss by providing an overall benefit to the species in another manner. In addition, there may be cases in which MNR may determine that development or site alteration under the PPS does not constitute the damage or destruction of habitat.

MNR is able to update what is to be considered the significant habitat of an endangered or threatened species on the basis of new information that becomes available (e.g., habitat regulation, permit issued, newly listed species). Such revisions to the area that MNR has approved as significant habitat will allow for planning decisions to be consistent with the PPS (i.e., development and site alteration are not permitted in significant habitat of endangered species and threatened species). MNR will work closely with planning authorities to help achieve coordination of the ESA and Planning Act processes.

Species classified as an endangered species and a threatened species for the purposes of PPS policy 2.1.3 are identified in the SARO List regulation to the ESA. The SARO List also classifies species as extirpated species and special concern species.[23]

---

[23] Special concern species should be considered for identifying significant wildlife habitat as per policy 2.1.4 of the PPS (see section 9.3.1).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The ESA includes transition provisions that phase in habitat protection for listed species. However, the policies of the PPS apply regardless of when the habitat protection provisions of the ESA take effect.

The manual identifies data sources for known occurrences and locations of species at risk and their habitats, but these do not document all actual occurrences and locations (see section 5.3). Development proponents should exercise due diligence to ensure that any activities being contemplated would not contravene the ESA.

Note:

A permit that would authorize the destruction of endangered or threatened species habitat under the ESA cannot be used to justify development and site alteration in a natural heritage feature where such is not permitted for other reasons (e.g., significant wetland). Individuals are responsible for ensuring that an activity being undertaken by or for them does not contravene the ESA.

5.2 Why Protect?

The protection of significant habitat of endangered and threatened species, especially habitat essential for reproduction or for survival at critical points in the life cycle, is fundamental for the recovery of these species at risk. Protection is necessary to prevent the extirpation of species from Ontario and to assist with their recovery.

As stated in the preamble to the ESA,

> Biological diversity is among the great treasures of our planet. It has ecological, social, economic, cultural and intrinsic value. Biological diversity makes many essential contributions to human life, including foods, clothing and medicines, and is an important part of sustainable social and economic development.
>
> Unfortunately, throughout the world, species of animals, plants and other organisms are being lost forever at an alarming rate. The loss of these species is most often due to human activities, especially activities that damage the habitats of these species. Global action is required.
>
> The United Nations Convention on Biological Diversity [1993] takes note of the precautionary principle, which, as described in the Convention, states that, where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat.
>
> In Ontario, our native species are a vital component of our precious natural heritage. The people of Ontario wish to do their part in protecting species that are at risk, with appropriate regard to social, economic and cultural considerations. The present generation of Ontarians should protect species at risk for future generations.

5.3 Identification

Under the ESA, MNR is responsible for giving technical advice on species identified on the SARO List and their habitats. For the purposes of the PPS, MNR is responsible for approving the delineation of significant habitat for species identified as endangered and threatened and MNR district offices should be contacted as part of early consultation (see section 12.2) when planning authorities or development proponents have reason to believe that an endangered or threatened species may be present.

Where MNR has not delineated or described the significant habitat, or otherwise defined habitat under the ESA, MNR district offices can provide information and guidance for identifying endangered and threatened species and their habitats found within a municipal planning area or within a proposed development area. Generalized mapping of the habitats and/or distributions can be used to help identify whether endangered and threatened species are present near an area proposed for a development application.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Delineated habitat of endangered and threatened species is considered sensitive information. The exact locations of these species should not be identified in municipal planning documents, and training is required to work with the data. Information sources for the identification and evaluation of significant habitat of endangered and threatened species are provided in appendix B. Further details regarding the delineation of habitat are contained in the following sections.

MNR is developing policy and procedures under the ESA that will help guide the identification of habitat for threatened and endangered species. When significant habitat information (for purposes of the PPS) is not available for a species, the local MNR district office should be contacted.

5.3.1 Process for Delineating Significant Habitat When Detailed Information Is Unavailable

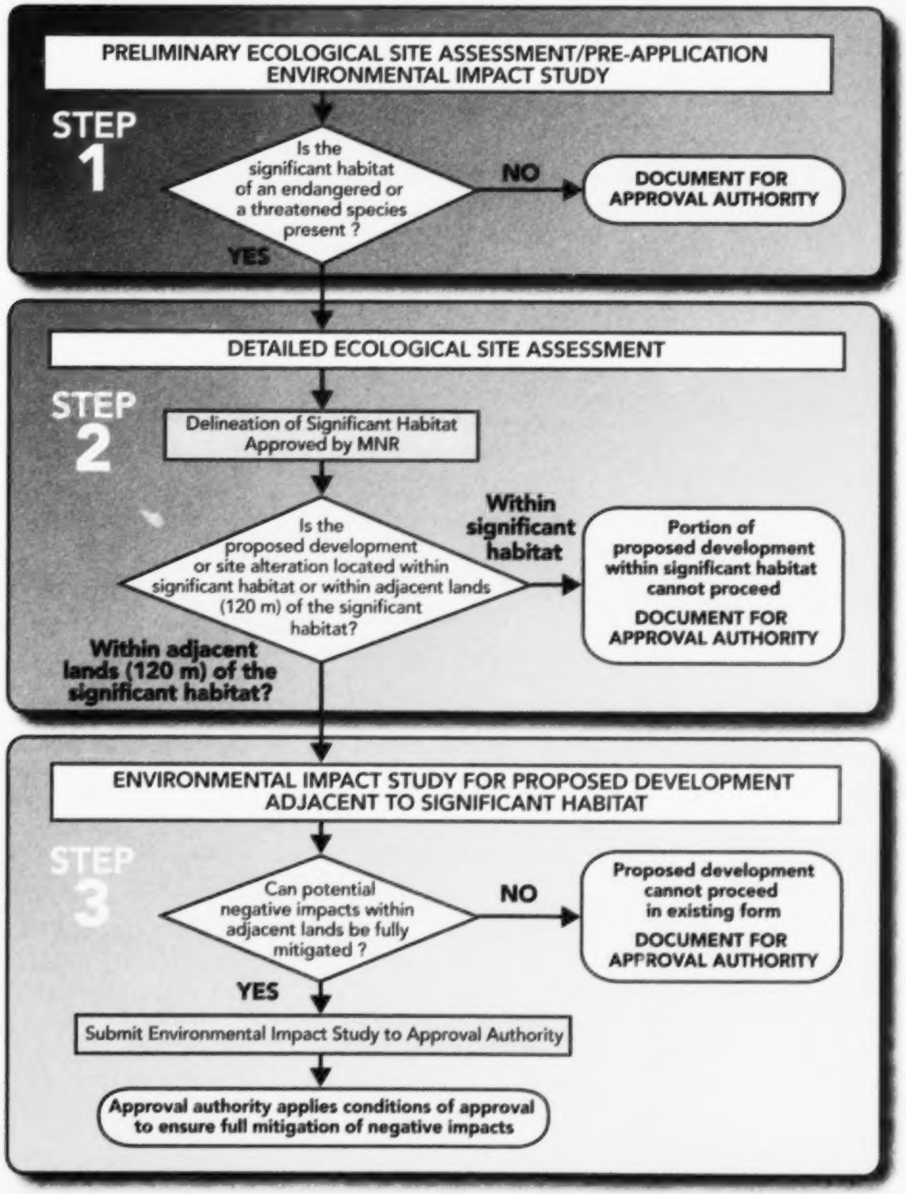
Species-specific habitat regulations and habitat descriptions will provide the most comprehensive information on the habitat requirements of endangered and threatened species until the significant habitats of these species are defined and meet MNR approval requirements. In the absence of habitat regulations or habitat descriptions, recovery strategies, species status reports or species occurrence information may be the starting point. It should be understood that identifying the significant habitat will vary considerably from species to species, depending on the individual species' habitat needs. Thus, the precise configuration of the significant habitat area should be determined by an individual with expert knowledge of the requirements of the species, taking into consideration local topographic features and other factors.

The process outlined in figure 5-1 and described in the ensuing pages is recommended for the identification of significant habitat until more information is known and made available by MNR about the location and extent of significant habitat for an endangered or threatened species. The process formalizes a logical progression in information gathering, based on the incremental understanding of the site with each step. It also incorporates MNR's recommendation that planning authorities should require an appropriate level of ecological site assessment by a qualified professional (see section 13.2), recognizing that existing species and habitat information may not be complete. Ideally, this process will be used in preparation for the submission of a planning application, realizing that it may not be necessary for proposals that present low risk to habitat (e.g., conversion of an existing building to a new use). MNR correspondingly would fulfill its technical responsibilities (e.g., approval of significant habitat) as part of early consultation. Steps should generally be followed in sequence from 1 to 3 ("applicant" can mean an agent or technical expert acting for the applicant).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Figure 5-1: Process for Identifying Significant Habitat of Endangered and Threatened Species


PRELIMINARY ECOLOGICAL SITE ASSESSMENT/PRE-APPLICATION ENVIRONMENTAL IMPACT STUDY
STEP 1
Is the significant habitat of an endangered or a threatened species present ?
NO
DOCUMENT FOR APPROVAL AUTHORITY
YES
DETAILED ECOLOGICAL SITE ASSESSMENT
STEP 2
Delineation of Significant Habitat Approved by MNR
Is the proposed development or site alteration located within significant habitat or within adjacent lands (120 m) of the significant habitat?
Within significant habitat
Portion of proposed development within significant habitat cannot proceed
DOCUMENT FOR APPROVAL AUTHORITY
Within adjacent lands (120 m) of the significant habitat?
ENVIRONMENTAL IMPACT STUDY FOR PROPOSED DEVELOPMENT ADJACENT TO SIGNIFICANT HABITAT
STEP 3
Can potential negative impacts within adjacent lands be fully mitigated ?
NO
Proposed development cannot proceed in existing form
DOCUMENT FOR APPROVAL AUTHORITY
YES
Submit Environmental Impact Study to Approval Authority
Approval authority applies conditions of approval to ensure full mitigation of negative impacts

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Step 1 – Preliminary Ecological Site Assessment/Pre-application Environmental Impact Study

The first requirement is to identify whether potential significant habitat for endangered or threatened species is present within or adjacent to the study area.

Since comprehensive mapping for most endangered and threatened species is not available, preliminary ecological site assessment is generally needed to identify the presence of any potential significant habitat of endangered or threatened species. The focus of preliminary ecological site assessment can be determined by reviewing one or more of the following (see appendix B):

- information about known occurrences within the recommended screening distance of at least 1 kilometre[24] (see paragraph below for further details);
- information provided by MNR to municipalities (e.g., screening information, species lists, range maps);
- in the absence of such MNR information, guidance from the local MNR district office;
- official plan mapping;
- existing local knowledge (e.g., that of conservation authority and municipal staff) of the area and the species likely to occur, given their ranges and habitat needs; and
- preliminary field investigations[25] (if needed to confirm the presence of species).

Known occurrences of endangered and threatened species can be helpful in determining the potential presence of significant habitat, and can be obtained in several ways. The Natural Heritage Information Centre (NHIC) provides the names of species and information about their general locations, based on element occurrences. Some species, particularly those that are illegally collected, may not be named in the NHIC geographic query due to concerns about releasing information about sensitive species to the public. As a result, some element occurrence locations of species at risk are described as those of "sensitive species." If more information on the element occurrence, such as the name and location of species, is needed for planning purposes, it can be requested from the MNR district office.

The database searches for element occurrences should encompass the subject lands and extend at least 1 kilometre from the boundary of the proposed development. This is to ensure that the generalized NHIC information is adequately screened for indications of potential significant habitat on the subject lands and their associated adjacent lands, which might be affected directly or indirectly by a proposed development.

Is the significant habitat of an endangered or a threatened species present?

If results of the preliminary ecological site assessment determine[26] that the significant habitat of an endangered or a threatened species is not present on the proposed development site or adjacent lands, no action is required. The proponent should submit this information to the appropriate planning authorities.

DOCUMENT FOR APPROVAL AUTHORITY

If results of the preliminary ecological site assessment determine that the significant habitat of an endangered or a threatened species may be present on the proposed development site or adjacent lands, then the proponent should continue through the step 2 options.

Note:

All endangered and threatened species encountered during the preliminary site assessment should be reported to the local MNR district office or the NHIC.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

[24] The 1 kilometre distance is based on the NHIC's spatial resolution for species' generalized locations.

[25] If field study of adjacent property is needed, this can occur only with the landowner's permission. Where access is not possible, remote observation approaches should be used.

[26] Endangered or threatened species and/or their habitat may be discovered on a property through an EIS or equivalent study initiated for other planning purposes. Observations of sensitive species recorded during this work should not be made publicly available through mapping or otherwise precisely identified in a document.

Step 2 – Detailed Ecological Site Assessment

A detailed ecological site assessment is required if the information resulting from step 1 determines that a site may provide or be adjacent to significant habitat for an endangered or threatened species. The following components of step 2 should be completed:

a. The applicant should contact MNR to determine whether more detailed information is available for any species occurrence located on or adjacent to the property, and whether MNR has established criteria or other considerations for determining significant habitat.

b. The applicant should undertake additional field investigations[27] to confirm the presence, status and population health of the identified species. This should be done at the appropriate time(s) of year, which will vary for different species.

c. The applicant should delineate the extent of any significant habitat that meets MNR criteria or seek MNR approval to confirm the identified area(s).[28]

If the applicant believes that the proposed development or site alteration is located within significant habitat or within adjacent lands (see section 5.4) of the significant habitat, the applicant may seek to obtain a permit under the ESA from MNR to allow damage to or destruction of the habitat. Where a permit is issued under the ESA to allow damage to or destruction of all or part of the habitat, the area approved as significant habitat of endangered species or threatened species will be revised where appropriate to exclude the area that will be negatively affected by the development or site alteration activity.

Conversely, any new habitat that is created or restored as a result of the conditions of a permit should be added to the area being approved as significant habitat of endangered species or threatened species under the PPS.

Step 2 will result in the delineation of significant habitat for approval by MNR and notification to the planning authority of the outcomes.

Is the proposed development or site alteration located within significant habitat or within adjacent lands (120 m) of the significant habitat?

If the proposed development or site alteration is located within the significant habitat, then the application cannot proceed unless it can be redesigned to avoid the significant habitat.

If the proposed development or site alteration is within adjacent lands (120 metres) of the significant habitat, the applicant should proceed to step 3.

Portion of proposed development within significant habitat cannot proceed

DOCUMENT FOR APPROVAL AUTHORITY

Step 3 – Environmental Impact Study for Proposed Development Adjacent to Significant Habitat

Step 3 applies to developments that are proposed within 120 metres of significant habitat (i.e., adjacent lands – see section 5.4).

The applicant should undertake an EIS or equivalent study that considers the following to demonstrate that the proposed development or site alteration will have no negative impacts within adjacent lands:

- whether the proposed development or site alteration could degrade the health or integrity of the significant habitat of endangered and threatened species or its ecological functions; and
- whether a detailed plan is required to avoid negative impacts on the identified species or its/their significant habitat.

The applicant should submit an EIS or equivalent study to the approval authority for review.

---

[27] To conduct field investigations (e.g., carrying out species collection or monitoring), an authorization under the ESA through the issuance of a permit may be required. For information, see MNR's Species at Risk webpages at http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/244440.html.

[28] MNR identifies such habitat by delineating/describing, reviewing and approving the work of others or establishing methods such as training and standards that ensure that the work of others will be acceptable.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Can potential negative impacts within adjacent lands be fully mitigated?

If potential negative impacts of the proposed development or site alteration cannot be addressed through redesign or mitigation measures, the proposal should not proceed.

Proposed development cannot proceed in existing form

DOCUMENT FOR APPROVAL AUTHORITY

If the proposed development or site alteration could have negative impacts on the natural features or ecological functions of the adjacent significant habitats, redesign and/or mitigation measures must be implemented through conditions of approval to remove the potential for such impacts.

If buffers are identified by the EIS or equivalent study and agreed on as being appropriate to avoid negative impacts from proposed developments or land use changes, then they should be implemented through the approval process and should become conditions of approval.

Approval authority applies conditions of approval to ensure full mitigation of negative impacts

Monitoring of the implementation and effectiveness of any mitigation measures should be an integral part of imposing conditions of approval. Planning authorities should obtain expert advice regarding the appropriateness of proposed mitigation measures and related monitoring.

Note:

- The locations of sensitive species observed and recorded during an EIS should not be mapped or otherwise precisely identified in a publicly available document.
- Any tracked species information, including that relating to endangered and threatened species, should be submitted to the NHIC or local MNR district office for inclusion in the NHIC database.
- While conditions of approval may be useful for implementing measures to avoid negative impacts, these should not be linked to obtaining a permit or exemption under the ESA.
- The 120 metre adjacent lands distance that is identified for significant habitat is a minimum distance for assessment (see below).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

5.4 Adjacent Lands

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a proposed development or site alteration must be addressed (see section 13 and appendix C). Proposed development on lands adjacent to significant habitat of endangered and threatened species may affect the natural features or ecological functions for which the area is identified, specifically the habitat requirements of the identified species.

Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions. In all cases, these approaches must meet the overall objective of ensuring that there will be no negative impacts on the significant habitat of endangered species and threatened species (see section 13).

PPS NATURAL HERITAGE FEATURE	**ADJACENT LANDS WIDTH** (distance from feature for considering potential negative impacts)
Significant habitat of endangered and threatened species	120 m

The Province recommends that adjacent lands are those lands within a minimum of 120 metres of the significant habitat of endangered or threatened species. This distance, however, is recommended only as the initial step in establishing an appropriate adjacent lands boundary. There are many considerations as to what may affect the size of adjacent lands (e.g., landscape, topography, type of development, the habitat requirements of specific species).

During the evaluation of the adjacent lands boundary, 120 metres may be considered to be insufficient for some species. For example, a road within 300 metres of a massasauga rattlesnake hibernaculum may be of concern, because this species is extraordinarily vulnerable to roadkill. The proposed definition of adjacent lands being 120 metres from the feature would not allow adequate consideration of the impacts of the road, because this species is known to travel distances greater than 120 metres. As other examples, pollutants and impacts on the groundwater table have the potential to affect endangered and threatened species at distances considerably greater than 120 metres. Though the boundary provides a minimum guideline, to be relevant an adjacent lands distance needs to be species specific and be validated scientifically. Further guidance is available in section 16.

Note:

Step 1 of the process set out above recommends that data (e.g., NHIC or other generalized information) be checked for known occurrences of endangered and threatened species within a minimum area of 1 kilometre around the proposed development. This provides a reasonable assurance that possible overlap between the habitat for endangered and threatened species and proposed developments would be identified when relying on generalized habitat information. The 1 kilometre screening distance is different from the recommended adjacent lands width. The latter is associated with potential impacts on significant habitat of endangered or threatened species, as approved by MNR.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

5.4 Adjacent Lands

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a proposed development or site alteration must be addressed (see section 13 and appendix C). Proposed development on lands adjacent to significant habitat of endangered and threatened species may affect the natural features or ecological functions for which the area is identified, specifically the habitat requirements of the identified species.

Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions. In all cases, these approaches must meet the overall objective of ensuring that there will be no negative impacts on the significant habitat of endangered species and threatened species (see section 13).

PPS NATURAL HERITAGE FEATURE	**ADJACENT LANDS WIDTH** (distance from feature for considering potential negative impacts)
Significant habitat of endangered and threatened species	120 m

The Province recommends that adjacent lands are those lands within a minimum of 120 metres of the significant habitat of endangered or threatened species. This distance, however, is recommended only as the initial step in establishing an appropriate adjacent lands boundary. There are many considerations as to what may affect the size of adjacent lands (e.g., landscape, topography, type of development, the habitat requirements of specific species).

During the evaluation of the adjacent lands boundary, 120 metres may be considered to be insufficient for some species. For example, a road within 300 metres of a massasauga rattlesnake hibernaculum may be of concern, because this species is extraordinarily vulnerable to roadkill. The proposed definition of adjacent lands being 120 metres from the feature would not allow adequate consideration of the impacts of the road, because this species is known to travel distances greater than 120 metres. As other examples, pollutants and impacts on the groundwater table have the potential to affect endangered and threatened species at distances considerably greater than 120 metres. Though the boundary provides a minimum guideline, to be relevant an adjacent lands distance needs to be species specific and be validated scientifically. Further guidance is available in section 16.

Note:

Step 1 of the process set out above recommends that data (e.g., NHIC or other generalized information) be checked for known occurrences of endangered and threatened species within a minimum area of 1 kilometre around the proposed development. This provides a reasonable assurance that possible overlap between the habitat for endangered and threatened species and proposed developments would be identified when relying on generalized habitat information. The 1 kilometre screening distance is different from the recommended adjacent lands width. The latter is associated with potential impacts on significant habitat of endangered or threatened species, as approved by MNR.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

6.0 SIGNIFICANT WETLANDS AND SIGNIFICANT COASTAL WETLANDS

6.1 Policy Explanation

2.1.3 *Development* and *site alteration* shall not be permitted in: ...

b) *significant wetlands* in Ecoregions 5E, 6E and 7E; and

c) *significant coastal wetlands.*

2.1.4 *Development* and *site alteration* shall not be permitted in:

a) *significant wetlands* in the Canadian Shield north of Ecoregions 5E, 6E, and 7E; ...

unless it has been demonstrated that there will be no *negative impacts* on the natural features or their *ecological functions.*

2.1.6 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4, and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions.*

Provincial Policy Statement 2005, policy 2.1
Italics indicate terms further defined in the PPS

Coastal wetland: means

a) any *wetland* that is located on one of the Great Lakes or their connecting channels (Lake St. Clair, St. Mary's, St. Clair, Detroit, Niagara and St. Lawrence Rivers); or

b) any other *wetland* that is on a tributary to any of the above-specified water bodies and lies, either wholly or in part, downstream of a line located 2 kilometres upstream of the 1:100 year floodline (plus wave run-up) of the large water body to which the tributary is connected.

Wetlands: means lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic plants or water tolerant plants. The four major types of wetlands are swamps, marshes, bogs and fens.

Periodically soaked or wet lands being used for agricultural purposes which no longer exhibit wetland characteristics are not considered to be wetlands for the purposes of this definition.

Significant: means

a) in regard to *wetlands, coastal wetlands* and *areas of natural and scientific interest,* an area identified as provincially significant by the Ontario Ministry of Natural Resources using evaluation procedures established by the Province, as amended from time to time; ...

Provincial Policy Statement 2005, 6.0 Definitions
Italics indicate terms further defined in the PPS

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

To be consistent with policies 2.1.3(b), 2.1.3(c), 2.1.4(a) and 2.1.6 of the PPS, planning authorities shall protect wetlands by:

- not permitting development and site alteration in significant wetlands in Ecoregions 5E, 6E and 7E and in significant coastal wetlands along all of the Great Lakes, their connecting channels and certain portions of their tributaries;
- not permitting development and site alteration in significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E unless it has been demonstrated that there will be no negative impacts on the significant wetland or its ecological function; and
- not permitting development and site alteration on adjacent lands unless their ecological functions have been evaluated and it is demonstrated that there will be no negative impacts on the significant wetland or significant coastal wetland feature or its ecological function.

In Ecoregions 5E, 6E and 7E of the province and for coastal wetlands, this means no loss of area or function of significant wetlands or significant coastal wetlands due to development or site alteration. In the Canadian Shield north of Ecoregions 5E, 6E and 7E, this means minimal loss of wetland area, with no loss of wetland function due to development or site alteration.

As indicated above, the PPS provides protection to wetlands according to location (see section 4.6). This reflects the fact that the central and southern areas in Ontario (Ecoregions 5E, 6E, and 7E) have suffered the highest rates of wetland loss and their remaining wetlands face the greatest threats from development.

Similarly, the protection afforded to significant coastal wetlands reflects the high losses of coastal wetlands that have occurred throughout the Great Lakes basin and the important values associated with them. Not all coastal wetlands defined in the PPS are considered significant. As with other wetlands defined in the PPS, coastal wetlands must be evaluated to be identified as significant and policy 2.1.3(c) must apply (see section 6.3.2).

The clarification in the definition for "wetlands" provides the important distinction that periodically soaked or wet lands used for agricultural purposes and no longer exhibiting wetland characteristics are not considered provincially significant for the purposes of the PPS. Users of the manual should also note that the PPS definition for "development" makes it clear that the term does not apply to works subject to the Drainage Act.

6.1.1 Peat Extraction

Peat extraction is an activity that can have significant negative impacts on the ecological, hydrological, social and economic values of wetlands. Impacts of extraction can include loss of vegetation and associated habitat for animals (potentially including species at risk); a lowering of the water table (due to drainage), which can affect local human uses and water supplies; degraded water quality; release of sequestered carbon; degraded air quality; and increased risk of fire. Where there is a planning application, the activities associated with extraction of peat constitute site alteration and as such are not permitted in significant wetlands.

There may be instances (e.g., expansion of peat extraction operations) in which no planning application is made. In these situations, planning authorities can use powers under the Municipal Act, 2001 to pass a site alteration by-law prohibiting the removal of top soil, which by definition includes peat[29] (see section 12.4).

---

[29] Under section 142 (8) of the Municipal Act, "If a regulation is made under section 28 of the *Conservation Authorities Act* respecting the placing or dumping of fill, removal of topsoil or alteration of the grade of land in any area of the municipality, a by-law passed under this section is of no effect in respect of that area"(see section 6.1.3).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

6.1.2 Relationship to PPS Water Policies

Policy 2.2 of the PPS contains direction for planning authorities to protect and improve or restore the quality and quantity of water by:

- using the watershed as the ecologically meaningful scale for planning;
- minimizing potential negative impacts, including cross-jurisdictional and cross-watershed impacts;
- identifying surfacewater features, groundwater features, hydrological functions and natural heritage features and areas that are necessary for the ecological and hydrological integrity of watersheds;
- maintaining linkages and related functions among surfacewater features, groundwater features, hydrological functions and natural heritage features and areas; and
- restricting development and site alteration in or near sensitive surfacewater features and sensitive groundwater features such that these features and their related hydrological function will be protected, improved or restored.

Wetlands, as both natural heritage features and surfacewater features, are a vital component of the functional connections identified above, providing the interface between water and land. Protection and restoration of wetland areas as part of source protection plans or watershed or subwatershed plans can contribute to achieving goals related to water quality and quantity. More information to support planning on a watershed basis is available in the manual in selected documents listed in the additional reading section.

6.1.3 Relationship to the Conservation Authorities Act

Under the Conservation Authorities Act, conservation authorities are empowered to restrict and regulate the use of wetlands. Development, as defined by the Conservation Authorities Act, taking place within or adjacent to a wetland in conversation authority regulated areas may require permission through a permit from the relevant conservation authority to confirm that the wetland is not changed or interfered with in any way.[30]

6.2 Why Protect?

Wetlands are habitats forming the interface between aquatic and terrestrial systems. The ecological, social and economic benefits that can be ascribed to wetlands are substantial (see section 6.3.1). They are among the most productive and biologically diverse habitats on the planet. By protecting wetlands, we contribute to the protection of plant and animal species, and surfacewater and groundwater resources. By the 1980s, 68 per cent of the original wetlands south of the Precambrian Shield had been lost through encroachment, land clearance, drainage and filling. Wetland losses have also occurred in northern Ontario, particularly near urban centres, along the Great Lakes shoreline and along other lakes and rivers.

Wetlands perform a number of important ecological and hydrological functions and provide an array of social and economic benefits that society values.

For example, wetlands:

- may be areas of groundwater recharge and discharge and as such contribute to a stable, long-term water supply;
- contribute to improved water quality through the trapping of sediments, the removal and/or retention of excess nutrients, the immobilization and/or degradation of contaminants and the removal of bacteria;

---

[30] Consistent with Ontario Regulation 97/04 of the Conservation Authorities Act, individual conservation authority regulations for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario Regulations 42/06 and 146/06 to 182/06) provide direction on the permitting process for wetlands. For more information, see Conservation Ontario's website at http://www.conservation-ontario.on.ca/planning_regulations/section28.html

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

- mitigate surfacewater flow by storing water during periods of peak flow, such as spring snowmelt and heavy rainfall events, and release water during periods of low flow (this mitigation of water flow also contributes to a reduction of flood damage);
- contribute to the stabilization of shorelines and to the reduction of erosion damage through the mitigation of water flow and soil binding by plant roots;
- act as "carbon sinks" – in Ontario making a significant contribution to carbon storage;
- contribute to the protection of other PPS natural heritage features by possibly providing significant habitat of endangered or threatened species, significant wildlife habitat and/or fish habitat;
- provide a high diversity of habitats that support a wide variety of flora and fauna, including habitat generalists (species that breed in a wide variety of both wetland and upland habitats), as well as wetland habitat-specific plant and wildlife species; for example, obligate wetland plant species (occurring 99 per cent of the time in wetlands under natural conditions), breeding amphibians, migrating and breeding waterfowl, shorebirds and certain songbirds;
- provide essential foraging, breeding and overwintering habitat for species that occupy upland habitat during other parts of their life cycle;
- provide ecological linkage corridors for the movement of species between terrestrial and aquatic habitats and the movement of species along streams and rivers;
- provide opportunities for recreation, education, research and tourism; and
- provide renewable harvesting for timber, fuel wood, fish, wildlife and wild rice.

Coastal wetlands are important for many reasons, such as the following:

- Coastal wetlands are the focus of binational conservation efforts through the Great Lakes Water Quality Agreement, which commits the United States and Canada to the restoration and maintenance of the chemical, physical and biological integrity of the Great Lakes basin ecosystem, of which coastal wetlands are an integral part.
- Coastal wetlands are the focus of the Great Lakes Wetlands Conservation Action Plan, a joint federal-provincial initiative.
- Coastal wetlands are recognized as unique and important areas because they provide, at a continental scale, habitat for many different species of migratory waterfowl.
- Coastal wetlands support numerous globally rare species and vegetation communities, and many of Ontario's Great Lakes fish species spawn in coastal wetlands.
- Many coastal wetlands have been designated as Important Bird Areas and recognized internationally for providing essential breeding or staging habitat for a significant proportion of certain bird species.
- Some coastal wetlands are recognized globally as Ramsar sites and/or United Nations Educational, Scientific and Cultural Organization (UNESCO) biological reserves.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

6.3 Identification

6.3.1 Significant Wetlands

"Significant wetlands," as defined by the PPS, are referred to as "provincially significant wetlands" (PSWs) when identified, mapped and scored using a scientific point-based ranking system known as the Ontario Wetland Evaluation System (OWES) (see below). A PSW, which needs to be identified or confirmed by MNR, is defined as any OWES evaluated wetland that scores:

- a total of 600 or more points; or
- 200 or more points in either the biological component or the special features component.

Not all wetlands have been evaluated. For a wetland that is unevaluated[31] but has characteristics or contains components that are typical of a significant wetland (e.g., significant species or functions), the planning authority should ensure that a wetland evaluation is undertaken (e.g., a stand-alone evaluation or as part of an EIS by the proponent, unless MNR has already identified the wetland as a work project) prior to processing any planning approvals. The planning authority should ensure that all evaluated and unevaluated wetlands are mapped and identified as part of an EIS (see section 13.2).

Planning authorities, especially those with relatively few wetland resources, may choose to apply some policy protection for wetlands that are not provincially significant. This would recognize the general environmental importance of wetlands and would be a way to ensure that unevaluated wetlands are not viewed imprudently as potential development areas.

Information sources for the identification and evaluation of significant wetlands and significant coastal are provided in appendix B.

6.3.1.1 The Ontario Wetland Evaluation System

MNR is responsible for the OWES, which provides a standardized method of assessing wetland functions and societal values and enables the Province to rank wetlands relative to one another. A wetland that has been evaluated using the criteria outlined in the OWES is known as an "evaluated wetland" and will have a "wetland evaluation file" relating to it.

The OWES manuals are the wetland "evaluation procedures" referred to in the PPS definition of "significant" (includes significant coastal wetlands). MNR periodically revises the procedures for evaluating wetlands.

The OWES identifies individual (referred to as "contiguous" in the OWES) wetlands and wetland complexes (see section 6.3.3) and measures wetland functions and values, providing a framework for evaluating the relative importance of individual ("contiguous") wetlands. It generates a numerical ranking of wetland values or functions, which are grouped into four main categories:

- biological component: recognizes that wetlands can differ in terms of productivity and habitat diversity
- social component: measures some of the direct human uses of wetlands, including economically valuable products (such as wild rice, commercial fish and furbearers), recreational activities and educational uses
- hydrological component: characterizes water-related values of wetlands, such as the reduction of flood peaks, contributions to groundwater recharge and discharge, and improvements to water quality
- special features component: addresses the geographic rarity of wetlands, the occurrence of species at risk, ecosystem age, and habitat quality for wildlife, including fish

The OWES consists of two manuals: the Southern Ontario Wetland Evaluation System (used to evaluate all wetlands located in Ecoregions 6 and 7) and the Northern Ontario Wetland Evaluation System (used to evaluate all wetlands located in Ecoregions 2, 3, 4, and 5). Coastal wetlands, as per the PPS definition, are scored using these OWES manuals.

---

[31] Wetlands can be initially identified through another process (e.g., ELC). Their significance and boundaries, however, must be evaluated through the OWES for the purposes of the PPS.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Wetlands can be identified and evaluated by MNR staff or by other qualified professionals, provided that they use the approved OWES methodology and have received MNR training in the use of the Province's wetland evaluation system. In all cases, MNR is responsible for reviewing and approving the evaluations. MNR recognizes only ministry-sanctioned wetland evaluation courses.

Wetland evaluations conducted by individuals trained by other organizations will not be considered. OWES training is required when conducting evaluations or verifying the locations of the outer boundaries of evaluated wetlands. MNR routinely offers training courses in wetland evaluation (see appendix B.1.2).

The OWES recognizes wetlands as dynamic systems that can change over time, and thus the wetland evaluation files MNR district offices maintain are considered "open files." These files can be amended from time to time as new information becomes available. Although the main character of a wetland is generally quite stable, outer boundaries can fluctuate and boundary verification or re-evaluation may be necessary occasionally. Factors for re-evaluation may include environmental ones (e.g., natural succession, changes in hydrology, new species occurrences) or societal ones (e.g., changes to the status of species, changes to the social values of the wetland).

As new science and technology become available, periodic revisions to the OWES itself may trigger review and update of existing evaluated wetland files. Until review or updating of existing evaluated wetland files is completed, the existing status of a wetland remains valid regardless of the edition/version of the OWES originally used. For example, a PSW evaluated in 1985 is still identified as a PSW in 2008, even if the evaluation file for that wetland has not been reviewed or updated since 1985.

The official boundaries of a PSW cannot be changed without the written concurrence of MNR. Planning authorities and consultants are asked to share any new information that they receive about evaluated wetlands with the local MNR district office (see appendix B).

6.3.2 Significant Coastal Wetlands

Evaluated wetlands and wetland complexes can include coastal wetlands, as per the PPS definition. Not all coastal wetlands are significant. A coastal wetland must meet the OWES scoring criteria for significance to become a significant coastal wetland for the purposes of policy 2.1.3(c).

6.3.3 Wetland Complexes

Many areas of Ontario contain closely spaced wetlands that vary in size from a fraction of a hectare to several hundred hectares. The topography of the landscape in which these wetlands occur, the short distances between some of the wetlands, and the density of wetlands per unit of areal landscape may be so complex that delineation of the wetland units into individually recognized wetlands would not be an ecologically or a functionally sound process. Such groupings of wetlands are referred to as "wetland complexes." For the purposes of the PPS, the OWES uses various criteria (e.g., distance) to identify and evaluate wetland complexes.

6.4 Adjacent Lands

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a development proposal must be addressed. They are defined in the PPS as "those lands contiguous to a specific *natural heritage feature or area* where it is likely that *development* or *site alteration* would have a *negative impact* on the feature or area."

The PPS states that development or site alteration will not be permitted within adjacent lands unless the ecological function of the adjacent lands has been evaluated, and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions. This critical evaluation of the adjacent lands is one of the most important parts of an EIS (see section 13).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

PPS NATURAL HERITAGE FEATURE	**ADJACENT LANDS WIDTH (distance from feature for considering potential negative impacts)**
Significant wetlands and significant coastal wetlands	120 m

The Province recommends that adjacent lands are those lands within 120 metres of individual significant wetlands or significant coastal wetlands or, in the case of wetland complexes, within 120 metres of individual wetlands that make up the complex. This recommended adjacent lands width was chosen because it is known that a reasonable probability exists that developments within 120 metres of wetlands will affect the ecological functions of the wetlands that they surround, and because wetland species are often dependent on adjacent lands for activities such as nesting, resting, and feeding or for shelter (see section 4.4.1).

Despite the preceding recommendation, it is important to recognize that some types of development can have an effect over greater distances, resulting in negative impacts on nearby wetlands. For example, the dewatering that occurs as a result of below-water-table aggregate extraction operations can cause significant water-table depressions in the surrounding area, which may require mitigation considerations. Consequently, there may be a need in some situations for greater adjacent lands widths, while in others smaller distances may suffice. The foregoing is meant to emphasize that site-specific evaluations done at the appropriate time or times of the year are needed to identify the distance that is most appropriate to the features and functions of the wetland and the nature of the development proposal.

The ecological functions of the adjacent lands, as defined by the PPS (see section 4.4) must be assessed in relation to the functions of a wetland. The extent of adjacent lands and their ecological functions needs to be determined on the basis of professional judgment and local circumstances.

Adjacent lands distances may vary depending on such factors as wildlife habitat function (see further discussion below), topography, soil types, hydrological connectivity, adjacent land uses and other features.

Examples not related to wildlife habitat could include local recharge areas adjacent to a wetland, vegetated areas that physically protect the wetland edge from sedimentation, and overhanging trees that provide detritus to support food webs.

An important factor in determining the extent of adjacent lands on the basis of wildlife habitat function is upland habitat. Upland habitat areas used as nesting habitat by turtles and waterfowl can occur a considerable distance from a wetland. Upland habitat may include vernal pool habitat for breeding amphibians, many of which inhabit a variety of wooded or late successional habitat in the non-breeding season. Amphibians must be able to access upland habitat in the summer for foraging and in the winter for hibernating. The upland habitat must be assessed as potential adjacent lands to determine an appropriate distance that will account for its potential importance to amphibians, and other species including reptiles, in completing their life cycles.

As noted previously, in certain circumstances, the adjacent lands width will need to be expanded beyond the recommendations provided in the manual, and there may be cases in which those expanded adjacent lands widths will require a buffer to cover the entire area to ensure that no negative impacts on the significant wetland occur (see section 4.5). The plant communities and other ecological features of adjacent lands that are found to be critical to the function of a wetland (e.g., fields that provide displaying or foraging areas for wetland birds, banks that provide nesting areas for turtles, breeding habitat for woodland frogs) should be included in, and will at least partly determine, any required mitigation, including buffers.

Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions (see section 4.4.2). In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on significant wetlands and significant coastal wetlands (see section 13).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

PPS NATURAL HERITAGE FEATURE	ADJACENT LANDS WIDTH (distance from feature for considering potential negative impacts)
Significant wetlands and significant coastal wetlands	120 m

The Province recommends that adjacent lands are those lands within 120 metres of individual significant wetlands or significant coastal wetlands or, in the case of wetland complexes, within 120 metres of individual wetlands that make up the complex. This recommended adjacent lands width was chosen because it is known that a reasonable probability exists that developments within 120 metres of wetlands will affect the ecological functions of the wetlands that they surround, and because wetland species are often dependent on adjacent lands for activities such as nesting, resting, and feeding or for shelter (see section 4.4.1).

Despite the preceding recommendation, it is important to recognize that some types of development can have an effect over greater distances, resulting in negative impacts on nearby wetlands. For example, the dewatering that occurs as a result of below-water-table aggregate extraction operations can cause significant water-table depressions in the surrounding area, which may require mitigation considerations. Consequently, there may be a need in some situations for greater adjacent lands widths, while in others smaller distances may suffice. The foregoing is meant to emphasize that site-specific evaluations done at the appropriate time or times of the year are needed to identify the distance that is most appropriate to the features and functions of the wetland and the nature of the development proposal.

The ecological functions of the adjacent lands, as defined by the PPS (see section 4.4) must be assessed in relation to the functions of a wetland. The extent of adjacent lands and their ecological functions needs to be determined on the basis of professional judgment and local circumstances.

Adjacent lands distances may vary depending on such factors as wildlife habitat function (see further discussion below), topography, soil types, hydrological connectivity, adjacent land uses and other features.

Examples not related to wildlife habitat could include local recharge areas adjacent to a wetland, vegetated areas that physically protect the wetland edge from sedimentation, and overhanging trees that provide detritus to support food webs.

An important factor in determining the extent of adjacent lands on the basis of wildlife habitat function is upland habitat. Upland habitat areas used as nesting habitat by turtles and waterfowl can occur a considerable distance from a wetland. Upland habitat may include vernal pool habitat for breeding amphibians, many of which inhabit a variety of wooded or late successional habitat in the non-breeding season. Amphibians must be able to access upland habitat in the summer for foraging and in the winter for hibernating. The upland habitat must be assessed as potential adjacent lands to determine an appropriate distance that will account for its potential importance to amphibians, and other species including reptiles, in completing their life cycles.

As noted previously, in certain circumstances, the adjacent lands width will need to be expanded beyond the recommendations provided in the manual, and there may be cases in which those expanded adjacent lands widths will require a buffer to cover the entire area to ensure that no negative impacts on the significant wetland occur (see section 4.5). The plant communities and other ecological features of adjacent lands that are found to be critical to the function of a wetland (e.g., fields that provide displaying or foraging areas for wetland birds, banks that provide nesting areas for turtles, breeding habitat for woodland frogs) should be included in, and will at least partly determine, any required mitigation, including buffers.

Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions (see section 4.4.2). In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on significant wetlands and significant coastal wetlands (see section 13).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

7.0 SIGNIFICANT WOODLANDS

7.1 Policy Explanation

> 2.1.4 *Development* and *site alteration* shall not be permitted in: …
>
> b) *significant woodlands* south and east of the Canadian Shield; …
>
> unless it has been demonstrated that there will be no *negative impacts* on the natural features or their *ecological functions.*
>
> 2.1.6 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4, and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions.*
>
> **Provincial Policy Statement 2005, policy 2.1**
> *Italics indicate terms further defined in the PPS*

> **Woodlands:** means treed areas that provide environmental and economic benefits to both the private landowner and the general public, such as erosion prevention, hydrological and nutrient cycling, provision of clean air and the long-term storage of carbon, provision of wildlife habitat, outdoor recreational opportunities, and the sustainable harvest of a wide range of woodland products. *Woodlands* include treed areas, woodlots or forested areas and vary in their level of significance at the local, regional and provincial levels.
>
> **Significant:** means … c) in regard to *woodlands*, an area which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or due to the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past management history; …
>
> **Provincial Policy Statement 2005, 6.0 Definitions**
> *Italics indicate terms further defined in the PPS*

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

To be consistent with policies 2.1.4(b) and 2.1.6 of the PPS, planning authorities shall protect significant woodlands south and east of the Canadian Shield (see figure 4-3) by:

- not permitting development and site alteration in significant woodlands south and east of the Canadian Shield unless it has been demonstrated that there will be no negative impacts on the feature or its ecological functions; and
- not permitting development and site alteration on adjacent lands unless the ecological function has been evaluated and it is demonstrated that there will be no negative impacts on the feature or its ecological function.

The PPS definitions for "woodlands" and "significant woodlands" are broad enough to complement other provincial legislation definitions (e.g., Forestry Act) and identification approaches (e.g., Greenbelt Plan) and should not be seen as contradictory to other provincial approaches for identifying woodlands or forests (e.g., ELC).

7.1.1 Relationship to the Forestry Act and Forest Conservation By-Laws

The identification and protection of significant woodlands do not preclude good forestry practices. Ideally, planning authorities should promote good forestry practices, which are defined under the Forestry Act as:

> the proper implementation of harvest, renewal and maintenance activities known to be appropriate for the forest and environmental conditions under which they are being applied and that minimize detriments to forest values including significant ecosystems, important fish and wildlife habitat, soil and water quality and quantity, forest productivity and health and the aesthetics and recreational opportunities of the landscape.

To support the PPS and good forestry practices, the Municipal Act, 2001 empowers all levels of municipalities (at their discretion) to pass forest conservation by-laws to regulate tree cutting and provide direction to landowners on how to sustainably manage their woodlands for financial and ecological benefits (see section 12.6). Activities associated with the development, management, conservation and sustainability of forests and urban forests are subject to the Professional Foresters Act, 2000.

7.2 Why Protect?

In less than 200 years, parts of southern Ontario have been altered from a predominantly forested landscape to one dominated by a wide variety of agricultural, industrial and urban land uses. In the part of the province south and east of the Canadian Shield, over 70 per cent of the original woodland cover has been lost (Riley and Mohr, 1994). Recent MNR compilations of woodland cover for upper- and single-tier municipalities indicate a range of woodland cover. For example, Essex County and Chatham-Kent County have less than 5 per cent forest cover, while Hastings County (south of the Canadian Shield) has over 50 per cent forest cover. Lower-tier municipalities would show an even greater range of woodland cover.

The protection of woodland cover in southern Ontario is an important concern. Woodland habitat loss is one of the most serious threats to biological diversity (Noss and Cooperrider, 1994; Meffe and Carrol, 1997; Marzluff and Ewing, 2001). The definition of "woodlands" in the PPS identifies a number of environmental and economic benefits derived from woodlands. A brief discussion of woodlands benefits is contained in table 7-1.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 7-1: PPS-Identified Woodland Benefits and Description

WOODLAND BENEFITS	DESCRIPTION
Soil erosion prevention	Woodlands prevent soil erosion through a combination of overhead crown cover and underground root structures.
Nutrient cycling	Plant root structures extract nutrients from the soil and convert the nutrients for use by other life forms.
Hydrological cycling	Woodlands affect both water quantity and quality by reducing the intensity and volume of stormwater runoff and decreasing soil erosion and flooding. By removing nutrients, sediments and toxins from surfacewater runoff and subsurface flows, woodland vegetation contributes to the maintenance of water quality in streams and lakes. The shade that woodlands adjacent to waterbodies provide helps keep water temperatures cool, maintaining high-quality habitat for desirable fish species such as brook trout, as well as providing a source of detritus for aquatic ecology. The existence of woodland cover contributes to the protection of groundwater recharge areas. Some woodlands are also wetlands (e.g., swamps, treed fens, treed bogs).
Flood and erosion reduction	Woodlands reduce flooding and erosion particularly as a mitigation measure to address the negative impacts of increased impervious cover associated with urban development. Maintaining woodlands saves money in retrofitting, erosion control and repair costs resulting from impacts of urbanization.
Clean air and the long-term storage of carbon	Woodland cover can play a significant role in mitigating episodes of poor air quality that may occur during periods of high ozone levels in the summer months. McPherson et al. (1997) and Scott et al. (1998) have shown the important role that urban forests play in reducing air pollution in an urban environment. Weathers et al. (2001) found that forest edges function as traps for wind-borne nutrients and pollutants. Trees facilitate long-term storage of carbon through the formation of wood (Roulet and Freedman, 1999).
Wildlife habitat	At the landscape scale, woodland cover and the distances between individual woodlands are important factors in maintaining woodland integrity and the survival of a large number of wildlife species that depend on woodlands. Environment Canada (2004) has noted that the axiom "the bigger, the better" appears to be in the process of being replaced by "the greater amount of habitat within the landscape mosaic, the better" (see Friesen et al., 1999; Rosenberg et al., 1999; Trzcinski et al., 1999; Austen et al., 2001; Golet et al., 2001; Fahrig, 2002; Lee et al., 2002; UTRCA, 2003). Environment Canada (2004) recommended that at least 30 per cent of each watershed should be in forest cover and that the land units with higher amounts of forest cover should maintain or improve that habitat with reference to the historic (pre-settlement) landscape.

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 7-1 *(continued from previous page)*

WOODLAND BENEFITS	DESCRIPTION
Outdoor recreational opportunities	Woodlands provide the desired setting for outdoor recreational activities such as hiking, wildlife observation and hunting, as well as for educational and research purposes. Woodlands are increasingly viewed as representing health, jobs and prosperity, community identity and quality of life in approaches that seek to minimize trade-offs between the environment and economic activity (Canadian Urban Institute and the Natural Spaces Leadership Alliance, 2006).
Sustainable harvest of woodland products	Woodlands also make a significant contribution to the economies of rural communities in southern Ontario through the sustainable provision of wood products, non-timber products such as maple syrup, and tourism.

7.3 Identification

Approaches to compiling and assessing woodland information will vary depending on the availability of information, the nature of the woodlands present in the planning area and the extent of development pressures on the woodland. Information sources for the identification and evaluation of significant woodlands are provided in appendix B. Planning authorities should undertake a comprehensive study to identify significant woodlands for their planning area.[32] Conducting a comprehensive study allows planning authorities to:

- establish a set of criteria as part of a focused planning process;
- apply consistent evaluations across the planning area;
- take into account the physiography of the landscape (e.g., moraines, clay plains);
- allow for the evaluation of woodland functions at the landscape level (e.g., providing linkages in a natural heritage system); and
- reduce resources needed to confirm site-specific details at a later planning stage.

An initial comprehensive study cannot assess all woodlands characteristics needed to determine significance (or in some cases resources may be unavailable to carry out the study). Some internal woodland characteristics (e.g., composition, diversity, age, structure or productivity) require site-level confirmation. Therefore, woodlands may be identified as potential or candidate significant woodlands for the purposes of the PPS until appropriate detailed studies can be undertaken at a later planning stage (e.g., development application) to confirm their status.

To assist in the identification of significant woodlands at all planning stages, the Province recommends that planning authorities develop and apply a set of evaluation criteria based on the factors and characteristics outlined in the following section.

---

[32] MNR district offices may be able to support planning authorities in undertaking a comprehensive study and can be contacted for more information (see appendix B.1.2).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 13
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

7.3.1 Recommended Evaluation Criteria for Determining Significant Woodlands

Table 7-2 and section 7.3.1.1 provide direction for the criteria for evaluating the significance of woodlands. The approach provides flexibility to accommodate various situations. Consideration of local factors and conditions may result in modifications to these criteria.

For example, in some areas, woodlands on slopes may be of particular interest and importance, thus indicating a need for a specific slope standard or criterion. Additional or merged criteria may be used where they are deemed more suited. Woodlands that meet a suggested minimum standard for any one of the criteria listed in table 7-2 should be considered significant. This evaluation approach will avoid overlooking sites that are outstanding in terms of only one criterion.

The recommended approach involves first assessing the conditions in the planning area to determine whether division into sub-units is appropriate. The study would then consider which individual evaluation criteria and threshold values are appropriate to classify a woodland as significant. Consideration may also be given to the stage of the planning process at which criteria that are more detailed would be applied.

In addition to the "woodland size" criterion shown in table 7-2, it is important to consider other criteria based on functions or characteristics in the identification of significant woodlands. Such functions or characteristics assist in identifying significant woodlands that may not meet the simple size criterion. Some criteria information (e.g., composition, diversity, age) to support the identification of significant woodlands may be obtained only by site inspection, which may occur at a later stage in the planning process. In the absence of more complete information, the size threshold should be reduced to include woodlands that otherwise would be missed. For example, where woodland cover is between about 15 and 30 per cent of the land base, woodlands closer to 4 hectares, rather than 20 hectares, could be considered significant. The size threshold and other criteria may be refined further with additional studies that may be undertaken during various stages of a planning process.

For other criteria in the table, a sample range of woodland size thresholds for significance is provided, where relevant, in parentheses. For example, the threshold range for proximity to other woodlands or other habitats is 0.5 to 20 hectares. A threshold toward the lower part of the range would be appropriate for a planning area with little forest cover, whereas a higher threshold would be suitable for a planning area with greater forest cover. In all cases, the threshold should be smaller than for the simple size criterion. Woodlands that meet a suggested minimum standard for any one of the criteria listed below should be considered significant.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 7-2: Recommended Significant Woodland Evaluation Criteria and Standards

CRITERIA COMMENTS	STANDARDS
1. WOODLAND SIZE CRITERIA	
• Size refers to the areal (spatial) extent of the woodland (irrespective of ownership). • Woodland areas are considered to be generally continuous even if intersected by narrow gaps 20 m or less in width between crown edges. • Size value is related to the scarcity of woodland in the landscape derived on a municipal basis with consideration of differences in woodland coverage among physical sub-units (e.g., watersheds, biophysical regions). • Size criteria should also account for differences in landscape-level physiography (e.g., moraines, clay plains) and community vegetation types.	Where woodlands cover: • is less than about 5% of the land cover, woodlands 2 ha in size or larger should be considered significant • is about 5–15% of the land cover, woodlands 4 ha in size or larger should be considered significant • is about 15–30% of the land cover, woodlands 20 ha in size or larger should be considered significant • is about 30–60% of the land cover, woodlands 50 ha in size or larger should be considered significant • occupies more than about 60% of the land, a minimum size is not suggested, and other factors should be considered *Note:* The size threshold should be reduced in the absence of information for the other three criteria. As a consideration in addressing the potential loss of biodiversity, the largest woodland in the planning area (or sub-unit) should be identified as significant.
2. ECOLOGICAL FUNCTIONS CRITERIA	
a. Woodland interior	
• Interior habitat more than 100 m from the edge (as measured from the limits of a continuous woodland as defined above) is important for some species. • For purposes of this criterion, a maintained public road would create an edge even if the opening was not wider than 20 m and did not create a separate woodland.	Woodlands should be considered significant if they have: • any interior habitat where woodlands cover less than about 15% of the land cover • 2 ha or more of interior habitat where woodlands cover about 15–30% of the land cover • 8 ha or more of interior habitat where woodlands cover about 30–60% of the land cover • 20 ha or more of interior habitat where woodlands cover more than about 60% of the land cover

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 7-2 *(continued from previous page)*

CRITERIA COMMENTS	STANDARDS
b. Proximity to other woodlands or other habitats	
• Woodlands that overlap, abut or are close to other significant natural heritage features or areas could be considered more valuable or significant than those that are not. • Patches close to each other are of greater mutual benefit and value to wildlife.	Woodlands should be considered significant if: • a portion of the woodland is located within a specified distance (e.g., 30 m) of a significant natural feature or fish habitat likely receiving ecological benefit from the woodland and the entire woodland meets the minimum area threshold (e.g., 0.5–20 ha, depending on circumstance)
c. Linkages	
• Linkages are important connections providing for movement between habitats. • Woodlands that are located between other significant features or areas can be considered to perform an important linkage function as "stepping stones" for movement between habitats.	Woodlands should be considered significant if they: • are located within a defined natural heritage system or provide a connecting link between two other significant features, each of which is within a specified distance (e.g., 120 m) and meets minimum area thresholds (e.g., 1–20 ha, depending on circumstance)
d. Water protection	
• Source water protection is important. • Natural hydrological processes should be maintained.	Woodlands should be considered significant if they: • are located within a sensitive or threatened watershed or a specified distance (e.g., 50 m or top of valley bank if greater) of a sensitive groundwater discharge, sensitive recharge, sensitive headwater area, watercourse or fish habitat and meet minimum area thresholds (e.g., 0.5–10 ha, depending on circumstance)
e. Woodland diversity	
• Certain woodland species have had major reductions in representation on the landscape and may need special consideration. • More native diversity is more valuable than less diversity.	Woodlands should be considered significant if they have: • a naturally occurring composition of native forest species that have declined significantly south and east of the Canadian Shield and meet minimum area thresholds (e.g., 1–20 ha, depending on circumstance) • a high native diversity through a combination of composition and terrain (e.g., a woodland extending from hilltop to valley bottom or to opposite slopes) and meet minimum area thresholds (e.g., 2–20 ha, depending on circumstance)

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 7-2 *(continued from previous page)*

CRITERIA COMMENTS	STANDARDS
3. UNCOMMON CHARACTERISTICS CRITERIA	
• Woodlands that are uncommon in terms of species composition, cover type, age or structure should be protected. • Older woodlands (i.e., woodlands greater than 100 years old) are particularly valuable for several reasons, including their contributions to genetic, species and ecosystem diversity.	Woodlands should be considered significant if they have: • a unique species composition or the site is represented by less than 5% overall in woodland area and meets minimum area thresholds (e.g., 0.5 ha, depending on circumstance) • a vegetation community with a provincial ranking of S1, S2 or S3 (as ranked by the NHIC and meet minimum area thresholds (e.g., 0.5 ha, depending on circumstance) • habitat (e.g., with 10 individual stems or 100 m^2 of leaf coverage) of a rare, uncommon or restricted woodland plant species and meet minimum area thresholds (e.g., 0.5 ha, depending on circumstance): – vascular plant species for which the NHIC's Southern Ontario Coefficient of Conservatism is 8, 9 or 10 – tree species of restricted distribution such as sassafras or rock elm – species existing in only a limited number of sites within the planning area • characteristics of older woodlands or woodlands with larger tree size structure in native species and meet minimum area thresholds (e.g., 1–10 ha, depending on circumstance): – older woodlands could be defined as having 10 or more trees/ha greater than 100 years old – larger tree size structure could be defined as 10 or more trees/ha at least 50 cm in diameter, or a basal area of 8 or more m^2/ha in trees that are at least 40 cm in diameter
4. ECONOMIC AND SOCIAL FUNCTIONAL VALUES CRITERIA	
• Woodlands that have high economic or social values through particular site characteristics or deliberate management should be protected.	Woodlands should be considered significant if they have: • high productivity in terms of economically valuable products together with continuous native natural attributes and meet minimum area thresholds (e.g., 2–10 ha, depending on circumstance) • a high value in special services, such as air-quality improvement or recreation at a sustainable level that is compatible with long-term retention and meet minimum area thresholds (e.g., 0.2–10 ha, depending on circumstance) • important identified appreciation, education, cultural or historical value and meet minimum area thresholds (e.g., 0.2–10 ha, depending on circumstance)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

7.3.1.1 Significant Woodland Evaluation Criteria Further Discussion

7.3.1.1.1 Woodland Size

Larger woodlands are more likely than smaller woodlands to contain a greater diversity of plant and animal species and communities. A larger size allows woodlands to maintain fuller, more resilient nutrient cycles and food webs, and to be big enough to permit different and important successional stages to co-exist (MNR 1991). Larger woodlands have a greater relative importance for mobile animal species such as forest birds. Small, isolated woodlands are more susceptible to the effects of blowdown, drought, disease, insect infestations, and invasions by predators and non-indigenous plants (Pearce 1992). As woodlands reach a particular size, their importance for a particular set of species can be predicted to a certain extent. A multitude of local effects, however, makes very precise predictions impossible.

It is known that the viability of woodland wildlife depends not only on the characteristics of the woodland in which they reside, but also on the characteristics of the landscape in which the woodland occurs. Woodlands are highly dependent on surrounding habitat.

The percentage of forest cover in the surrounding landscape, the presence of ecological barriers such as roads, the ability of various species to cross the matrix surrounding the woodland and the proximity of adjacent habitats interact with woodland size in influencing the species assemblage within a woodland.

Woodland size should be evaluated in the context of the percentage of forest cover for the planning area (generally on the basis of a municipal or watershed boundary). Size criteria should also account for differences in landscape-level physiography (e.g., moraines, clay plains). In planning areas with little forest cover, small woodlands are increasingly important for providing woodland values and contributing to biodiversity by having special site characteristics (soil, climate, species or genes) that are not represented in other locations. In areas with a higher percentage of forest cover, smaller woodlands still may be significant for the factors listed above and should not be dismissed because of an abundance of surrounding forest land.

Regardless of landscape context, the largest woodlands in the planning area (or sub-unit) should be identified as significant. This recognizes the functional importance of large woodlands and attempts to address incremental fragmentation.

7.3.1.1.2 Ecological Functions

For purposes of identifying and evaluating significant woodlands in the NHRM, ecological functions that should also be considered are woodland interior, proximity to other woodlands or other habitats, linkages, water protection and woodland diversity.

Woodland interior habitat, usually defined as habitat more than 100 metres from the edge of the woodland, is important for some species (Askins et al., 1987; LandOwner Resource Centre and Ontario Ministry of Natural Resources, 2000), although it is now recognized that the overall percentage of woodlands within a landscape may have as much influence on a woodland's functions as the amount of edge. The 100 metre distance provides for relative seclusion from outside influences. The presence of such interior habitat provides a moister, more sheltered and productive forest habitat for certain sensitive species (Henshaw and Leadbeater, 1999). Woodlands with interior habitat have centres that are more clearly buffered against the edge effects of agricultural activities or more harmful urban activities than those without. Environment Canada (2004) recommended that more than 10 per cent of the land in planning units of the Great Lakes basin should be covered by interior forest habitat.

Woodlands that overlap, abut or are close to other significant natural heritage features or areas could be considered more valuable or significant than those that are not. Similarly, woodlands that are located between other significant features or areas can be considered to perform an important linkage function as "stepping stones." In addition, situations that enable woodlands to protect water sources are significant.

Woodlands composed of representative native species that have declined significantly south and east of the Canadian Shield (e.g., generally on deep-soiled uplands and fertile level plains where such locations have been largely cleared for other uses) provide significant contributions to the overall biodiversity of the landscape. Woodlands that extend across a variety of terrain features tend to consist of a broader range of vegetation communities than those occurring in more uniform settings. These more diverse woodlands may individually contain more plant and animal species, and provide more habitat features.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

7.3.1.1.3 Uncommon Characteristics

Forests in southern Ontario have been shaped by their ecological setting and historical disturbances. It is important to retain on the landscape woodlands that contain uncommon or outstanding woodland features. These woodlands contribute to the overall health, diversity and well-being of our forested landscape and may provide special habitats and other ecological values that are important to society.

Woodlands that contain rare or uncommon community types, important habitats of a species that is at risk or important habitats of species that are rare or restricted in their distribution, and woodlands that are dominated by old or large trees should be considered significant.

7.3.1.1.4 Economic and Social Values

Managed woodlands can provide many direct socio-economic benefits, as well as natural attributes. Southern Ontario woodlands can yield forest products (e.g., timber, maple syrup) of high economic value. They may also be managed for multiple benefits, including wildlife habitat or recreation at a level that is compatible with long-term ecological sustainability. In urban areas, air-quality improvement may be of particular importance. Planning authorities also have the ability to recognize the importance of the educational, natural heritage, cultural or historical values that woodlands provide especially in proximity to settlement areas.

7.3.2 Delineation of Woodland Patches

Developing a process for delineating woodland patches has many challenges that need to be addressed. For example, legislation and other sources outside the PPS vary in terms of how they define a woodland in relation to factors such as size, species composition and coverage by trees. Treed areas separated by small openings have important ecological functions in combination and could still be considered as a single woodland. It may be necessary, however, to establish a maximum distance between woodland patches beyond which the patches would be considered independent of each other.

Planning authorities may wish to consider delineating woodland patches for the purposes of assessing their significance using an approach based on the percentage of tree cover[33] and/or the Forestry Act definition for "woodlands."[34] The combined approach will allow woodland patches to be identified using aerial photography with a ground-truthing component based on stem counts when needed.

Specific guidance relating to questions such as tree definition, woodland origin (i.e., naturally occurring or planted) and proximity of patches is briefly described below:

- Plantations: Generally, plantations (excluding fruit orchards or Christmas tree plantations) are recognized as investments made with the objective of forest restoration and can be considered to be woodlands.
- Woodland openings: A bisecting opening 20 metres or less in width between crown edges is not considered to divide a woodland into two separate woodlands. The area of the developed opening (e.g., maintained public road or rail line) is not included in the woodland area calculation.
- Minimum patch width: This width is intended to exclude relatively narrow linear treed areas such as hedgerows. The minimum average width for significance can be related to the woodland size threshold being applied. For example, a minimum 40 metre average width where the size threshold is 4 hectares or less can be increased to a 60 metre width where the size threshold is 10 hectares or more.

For further information about woodland patch delineation, planning authorities should contact their local MNR district office.

---

[33] For example, the ELC approach defines a "forest" as tree cover greater than 60 per cent (see appendix 8.1.2).

[34] Under the Forestry Act, "woodlands" means land with at least:
- 1,000 trees of any size per hectare; or
- 750 trees measuring over 5 centimetres in diameter, per hectare; or
- 500 trees measuring over 12 centimetres in diameter, per hectare; or
- 250 trees measuring over 20 centimetres in diameter, per hectare but does not include a cultivated fruit or nut orchard or a plantation established for the purpose of producing Christmas trees.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

7.4 Adjacent Lands

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a development proposal must be addressed. The extent of adjacent lands may vary, depending on such factors as potential changes to surfacewater hydrology, survivability of trees located near a woodland edge and disruption to wildlife movement patterns. Adjacent lands may be defined using a variety of approaches, depending on site-specific conditions (see section 4.4.2). In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on significant woodlands from incompatible development (see section 13).

PPS NATURAL HERITAGE FEATURE	ADJACENT LANDS WIDTH (distance from feature for considering potential negative impacts)
Significant woodlands	120 m

For the purposes of policy 2.1.6 of the PPS, the Province recommends that adjacent lands are those lands within 120 metres of a significant woodland. This distance is recommended since development and land uses within 120 metres of woodlands have a reasonable probability of affecting the ecological functions of the woodlands (see section 4.4.1).

Considerations in recommending an adjacent lands area include:

- sensitivities of the plant and animal species in the woodland;
- potential for direct and indirect disruption, and changes in soil moisture and compaction;
- susceptibility to erosion;
- fear of hazards from falling edge trees that are functional when standing (e.g., as screening or cavity habitat trees); and
- the cumulative impacts of potential nearby developments and uses (see section 13).

Site-specific evaluations based on these considerations may demonstrate the need for greater or lesser adjacent lands widths.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

7.4 Adjacent Lands

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a development proposal must be addressed. The extent of adjacent lands may vary, depending on such factors as potential changes to surfacewater hydrology, survivability of trees located near a woodland edge and disruption to wildlife movement patterns. Adjacent lands may be defined using a variety of approaches, depending on site-specific conditions (see section 4.4.2). In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on significant woodlands from incompatible development (see section 13).

PPS NATURAL HERITAGE FEATURE	ADJACENT LANDS WIDTH (distance from feature for considering potential negative impacts)
Significant woodlands	120 m

For the purposes of policy 2.1.6 of the PPS, the Province recommends that adjacent lands are those lands within 120 metres of a significant woodland. This distance is recommended since development and land uses within 120 metres of woodlands have a reasonable probability of affecting the ecological functions of the woodlands (see section 4.4.1).

Considerations in recommending an adjacent lands area include:

- sensitivities of the plant and animal species in the woodland;
- potential for direct and indirect disruption, and changes in soil moisture and compaction;
- susceptibility to erosion;
- fear of hazards from falling edge trees that are functional when standing (e.g., as screening or cavity habitat trees); and
- the cumulative impacts of potential nearby developments and uses (see section 13).

Site-specific evaluations based on these considerations may demonstrate the need for greater or lesser adjacent lands widths.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 143
Natural Heritage Information Sources 166
Glossary [illegible]
About Cover [illegible]

8.0 SIGNIFICANT VALLEYLANDS

8.1 Policy Explanation

> 2.1.4 *Development* and *site alteration* shall not be permitted in: …
>
> c) *significant valleylands* south and east of the Canadian Shield; …
>
> unless it has been demonstrated that there will be no *negative impacts* on the natural features or their *ecological functions*; …
>
> 2.1.6 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4 and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions*.
>
> **Provincial Policy Statement 2005, policy 2.1**
> *Italics indicate terms further defined in the PPS*

> **Valleylands:** means a natural area that occurs in a valley or other landform depression that has water flowing through or standing for some period of the year.
>
> **Significant:** means … d) in regard to other features and areas in policy 2.1, ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or *natural heritage system*; …
>
> **Provincial Policy Statement 2005, 6.0 Definitions**
> *Italics indicate terms further defined in the PPS*

To be consistent with policies 2.1.4(c) and 2.1.6 of the PPS, planning authorities must sustain the connectivity values of valleylands southand east of the Canadian Shield (see figure 4-3) by:

- not permitting development and site alteration in significant valleylands unless it has been demonstrated that there will be no negative impacts on the feature or its ecological function; and
- not permitting development and site alteration on adjacent lands unless the ecological function has been evaluated and it is demonstrated that there will be no negative impacts on the feature or its ecological function.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

8.1.1 Relationship to the Conservation Authorities Act

Under the Conservation Authorities Act, conservation authorities are empowered to regulate development and activities in or adjacent to river or stream valleys, watercourses and hazardous lands (e.g., unstable soils, unstable bedrock). Development, as defined by the Conservation Authorities Act, taking place within or adjacent to river or stream valleys, watercourses and hazardous lands in conversation authority regulated areas may require permission through a permit from the relevant conservation authority to confirm that the area is not altered in any way.[35]

8.2 Why Protect?

As the "backbone" of a watershed, valleys perform important ecological functions. (e.g., diverse habitats in valleylands due to microclimate variations). Planning authorities should carefully assess their valleyland systems relative to the overall protection of natural heritage features. Planning authorities may choose to designate an entire valley or portions of a valley as a significant valleyland, depending on the extent and quality of the valleyland resource within the jurisdiction of the planning authority.

As the natural drainage systems for watersheds , valleys provide an appropriate context for planning and evaluating water-related resources. It is suggested that the natural heritage significance of valleylands be assessed within the context of the overall watershed.

Aside from their natural heritage value, valleys are also extremely important to our social well-being and cultural history. They enhance our quality of life and provide economic diversity and vitality through the resources they contain. Some of the cultural values of valleys are:

- representation of European colonization in settlement towns, bridges and mills;
- archaeological resources representative of Aboriginal cultures;
- important economic resources such as aggregates, agriculture and forestry;
- a wide variety of recreation activities such as nature appreciation, hiking, fishing and hunting, swimming, boating, parks and golf courses;
- centres of contemporary human habitation in towns and cities; and
- a source of drinking water and an area for treating wastewater.

In highly urbanized or fragmented landscapes, valleylands may constitute the only remaining natural areas within the planning area and are often considered essential in defining the basic character of a community. In these planning areas, valleylands are essential for establishing connectivity for a natural heritage system. Consequently, valleylands should be identified as an integral part of a planning authority's overall natural heritage system.

---

[35] Consistent with Ontario Regulation 97/04 of the Conservation Authorities Act, individual conservation authority regulations for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario Regulations 42/06 and 146/06 to 182/06) provide direction on the permitting process. For more information, see Conservation Ontario's website at http://www.conservation-ontario.on.ca/planning_regulations/section28.html

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

8.3 Identification

The identification and evaluation of significant valleylands based on the recommended criteria from MNR (see section 8.3.1) is the responsibility of planning authorities. Many conservation authorities have identified valleylands as part of their regulation mapping (see section 8.1.1) and may be able to provide mapping to support the evaluation process. Information sources for the identification and evaluation of significant valleylands are provided in appendix B.

The adoption of a natural heritage system approach (see section 3) is useful in identifying and evaluating valleylands. While upland linkages also are important for natural heritage systems, the identification of significant valleylands based on their connectivity function within natural heritage systems can be essential in a highly fragmented or urban landscape.

To identify significant valleylands, an understanding of their hydrological and geomorphic structure is important. Valleys are linear systems that stretch across the landscape from their origins in headwater areas to their outlets into other aquatic systems such as wetlands and lakes. Valleys connect natural areas within the landscape over large distances, providing migration and dispersal corridors for terrestrial, aquatic and avian species. Valleys also have a lateral dimension, and criteria based on geomorphology are frequently used to define the lateral limits of valleys. Geomorphic criteria define the "macro-form" or "wall" of the valley, indicating where the slope of the valley form begins to grade into the surrounding upland plains or tablelands. Where topography does not define the valley form well, criteria based on floodlines or the meander belt width of a river system may be used. Valleys are dynamic and should be delineated on the basis of the historic, current and likely future zone of geomorphic influences.

The physical boundaries of valleys should first be identified. Some valleylands are found within a distinct valley landform. Others, within headwater areas, may not have a defined watercourse channel where flow is overland and originates from springs, seepage areas and surface runoff. The physical boundaries are generally determined as follows:

- For well-defined valleys, the physical boundary is generally defined by the stable top-of-bank or the predicted top-of-bank (also known as "top of slope" or "top of valley").
- For a less well-defined valley or stream corridor, the physical boundary may be defined in a number of ways, including the consideration of riparian vegetation, the flooding hazard limit, the meander belt or the highest general level of seasonal inundation.

8.3.1 Recommended Evaluation Criteria for Determining Significant Valleylands

Table 8-1 provides recommended criteria for evaluating and identifying significant valleylands. Consideration of local factors and conditions may result in modifications to these criteria and planning authorities need to determine which criteria should be applied in order for a valleyland to be considered significant. The recommended approach involves first assessing the conditions in the planning area to determine whether division into sub-units is appropriate. The study would then consider which individual evaluation criteria and standards values are appropriate to classify a valleyland as significant. Consideration may also be given to the stage of the planning process at which more detailed criteria would be applied.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 8-1: Recommended Significant Valleylands Evaluation Criteria and Standards

CRITERIA	COMMENTS	STANDARDS
LANDFORM-RELATED FUNCTIONS AND ATTRIBUTES		
Surfacewater functions	• Valleylands are areas of water conveyance, attenuation, storage and release. • They are characterized by shifting patterns of erosion and deposition that result in short- and long-term cycles of change. • The intent of this criterion is to recognize the significance of the "water/sediment conveyance function"[36] of watercourses.	• areas of water conveyance from catchment areas of 50 ha or greater, as defined by a stream channel conveying or holding water for at least two months of the year, or as defined by floodlines or by the meander belt width • areas of active or historic erosion as characterized by exposed soils on shorelines, river banks, valley walls and instream islands • areas of active or historic deposition characterized by alluvial soils forming bottomlands, terraces, levees and instream or river-mouth deltas or islands • associated wetlands important to water attenuation, storage and release
Groundwater functions	• Valleylands may be characterized by areas of groundwater infiltration and areas where groundwater is released as springs, seepage slopes or as part of the maintenance of wetlands and the baseflow of streams or rivers.	• areas contributing to groundwater infiltration; areas that make an important contribution to infiltration in the region • areas of groundwater release (i.e., springs, seepage slopes, wetlands)
Landform prominence	• Large, well-defined valleylands are often significant landscape features essential to the character of an area.	• areas with well-defined valley morphology (e.g., floodplains, meander belts, valley slopes) having an average width of 25 m or more • valleylands with boundaries defined on the basis of standard procedures such as those in the Adaptive Management of Stream Corridors in Ontario including Natural Hazards Technical Guides, and Understanding Natural Hazards (see appendix B.1.2)
Distinctive geomorphic landforms	• Action of water within valleylands can lead to the development of distinctive landforms within the landscape.	• distinctive landforms based on their representation of geomorphological processes and features, quality and rarity • features such as oxbows, bottomlands, terraces, deltas, exposed soil strata or eroding slopes along riverbanks or valley walls

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

[36] The measures may be associated with the volume of water/sediment transported and the ecological significance of the water/sediment contribution to the valleyland. The scientific literature does not provide a simple measure, due to complex factors of terrain/slope, soil type, precipitation regime, groundwater level, vegetation cover, etc. that influence water/sediment conveyance for any one watercourse. The recommended standards are a starting point for the consideration of significance.

Table 8-1 *(continued from previous page)*

CRITERIA	COMMENTS	STANDARDS
	ECOLOGICAL FEATURES	
Degree of naturalness	• Valleylands that are relatively undisturbed have greater natural heritage value than disturbed valleylands. • Valleylands that have a high proportion of natural vegetation cover also help buffer waterbodies from the effects of agricultural land use and urban development.	• areas of contiguous woodland, wetland and/or meadow considered cumulatively • the proportion of valleyland that has natural vegetation cover vs. a cultural use (e.g., golf course, landscaped parkland, agricultural field, urban area) – greater than 25% natural vegetation cover should be considered significant • proportion of valleyland that has natural riparian vegetation • riparian vegetation greater than 30 m in width on each side of surfacewater features should be considered significant • assessment of Floristic Quality Index (FQI) score (Oldham et al., 1995) – high FQI in the context of the local watershed should be considered significant
Community and species diversity	• Valleylands are characterized by diverse topography, soils, exposure, and moisture regimes, etc., which result in landscapes of high community and species diversity.	• areas of high community and/or species diversity
Unique communities and species	• Valleylands are characterized by micro-environments that may provide conditions for unusual communities and species. • Valleylands tend to have a greater proportion of natural areas than the surrounding landscape and as such protect rare communities and/or the habitat of rare species.	• seasonally important habitats such as deer yards, migration stopovers, etc. • high proportion of regionally and locally significant species • rare communities or the habitat of rare species, based on federal or provincial guidelines

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 8-1 *(continued from previous page)*

CRITERIA	COMMENTS	STANDARDS
Habitat value	• Natural areas within valleylands and healthy aquatic systems are more valuable to wildlife than disturbed valleylands.	• areas determined to provide important habitat required to sustain native aquatic and terrestrial species diversity within the region
Linkage function	• Valleylands provide terrestrial and aquatic linkages within the watershed. • Valleylands provide important corridors, allowing for the natural movement and dispersal of aquatic and terrestrial plants and animals. • Maintaining linkages for plant and animal movement will help mitigate climate change impacts.	• the portion of the valleyland with continuous natural vegetation corridors with a minimum width of 100 m • areas with functional ecological connections to other natural areas within the watershed both inside and outside the valleylands • areas that are determined to provide important wildlife corridors
RESTORED ECOLOGICAL FUNCTIONS		
Restoration potential and value	• Valleylands that have been altered extensively and cannot be restored are less valuable than those that can be restored. • Restoration of riparian vegetation should be considered, wherever possible, to provide a buffer for surrounding land, to provide natural linkage along valleylands and to enhance existing natural areas.	• restoration will provide important ecological benefits such as linkage function, improvement of habitat for rare species, reduced fragmentation effects, and/or increased core natural areas • areas where restoration will provide a minimum 30 m corridor of riparian vegetation on each side of surfacewater features • areas where the public is interested in assisting in the implementation of ecological restoration • areas that are in public ownership and that would benefit from restoration • areas where restoration would buffer existing natural areas from the effects of adjacent development

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

8.3.2 Cultural Heritage Resources

Valleylands can have cultural heritage value in terms of policy 2.6 of the PPS that planning authorities may want to consider at the same time as they are evaluating the natural heritage significance. Built heritage resources such as designated buildings or visible ruins may be located in natural valleys, and the integration of both natural and cultural elements may be considered as a significant "cultural heritage landscape," as defined in the PPS.

8.4 Adjacent Lands

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a development proposal must be addressed. Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions. In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on significant valleylands (see section 13). When valleylands are associated with other features such as woodlands, wetlands, fisheries habitat and so on, the relevant sections of this manual should be consulted for guidance on defining adjacent lands.

PPS NATURAL HERITAGE FEATURE	ADJACENT LANDS WIDTH (distance from feature for considering potential negative impacts)
Significant valleylands	120 m

Where there are no other features of provincial interest associated with a valleyland feature, the Province recommends that adjacent lands are those lands within 120 metres of significant valleylands. This adjacent lands width is recommended on the basis of concerns related to the protection of features adjacent to valleylands such as woodlands and wildlife habitat, as well as concerns related to protection of natural hazard lands (wetlands, flood-prone areas and unstable slopes) (see section 4.4.1). Site-specific evaluations based on the considerations noted above may demonstrate the need for greater or lesser adjacent lands widths. However, the foregoing does not affect the application of regulations under the Conservation Authorities Act (see section 8.1.1).

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

8.3.2 Cultural Heritage Resources

Valleylands can have cultural heritage value in terms of policy 2.6 of the PPS that planning authorities may want to consider at the same time as they are evaluating the natural heritage significance. Built heritage resources such as designated buildings or visible ruins may be located in natural valleys, and the integration of both natural and cultural elements may be considered as a significant "cultural heritage landscape," as defined in the PPS.

8.4 Adjacent Lands

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a development proposal must be addressed. Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions. In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on significant valleylands (see section 13). When valleylands are associated with other features such as woodlands, wetlands, fisheries habitat and so on, the relevant sections of this manual should be consulted for guidance on defining adjacent lands.

PPS NATURAL HERITAGE FEATURE	**ADJACENT LANDS WIDTH** (distance from feature for considering potential negative impacts)
Significant valleylands	120 m

Where there are no other features of provincial interest associated with a valleyland feature, the Province recommends that adjacent lands are those lands within 120 metres of significant valleylands. This adjacent lands width is recommended on the basis of concerns related to the protection of features adjacent to valleylands such as woodlands and wildlife habitat, as well as concerns related to protection of natural hazard lands (wetlands, flood-prone areas and unstable slopes) (see section 4.4.1). Site-specific evaluations based on the considerations noted above may demonstrate the need for greater or lesser adjacent lands widths. However, the foregoing does not affect the application of regulations under the Conservation Authorities Act (see section 8.1.1).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

9.0 SIGNIFICANT WILDLIFE HABITAT

9.1 Policy Explanation

> 2.1.4 *Development* and *site alteration* shall not be permitted in: …
>
> d) *significant wildlife habitat*; …
>
> unless it has been demonstrated that there will be no *negative impacts* on the natural features or their *ecological functions.*
>
> 2.1.6 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4 and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions.*
>
> **Provincial Policy Statement 2005, policy 2.1**
> *Italics indicate terms further defined in the PPS*

> **Wildlife habitat:** means areas where plants, animals and other organisms live, and find adequate amounts of food, water, shelter and space needed to sustain their populations. Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual or life cycle; and areas which are important to migratory or non-migratory species.
>
> **Significant:** means … d) in regard to other features and areas in policy 2.1, ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or *natural heritage system*;
>
> **Provincial Policy Statement 2005, Section 6.0 Definitions**
> *Italics indicate terms further defined in the PPS*

To be consistent with policies 2.1.4(d) and 2.1.6 of the PPS, planning authorities shall protect significant wildlife habitat by:

- not permitting development and site alteration in significant wildlife habitat unless it has been demonstrated that there will be no negative impacts on the feature or its ecological function; and
- not permitting development and site alteration on adjacent lands unless the ecological function has been evaluated and it is demonstrated that there will be no negative impacts on the feature or its ecological function.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

9.2 Why Protect?

The provision of habitat is one of the primary ecological functions of natural heritage features and areas. The protection and management of wildlife habitat, whether it be significant as per the PPS or locally important, is fundamental to the maintenance of self-sustaining populations of wildlife, and thus to biodiversity.

Habitat fragmentation (e.g., loss of interior forest) due to development has affected many groups of species, most notably area-sensitive birds and amphibians that breed in vernal forest pools. Loss of nesting habitat for turtle species and loss of habitat for early successional wildlife and plants have become of increasing concern in recent years.

The loss of these habitats may result in the loss of the species locally or reductions in the size of their populations. The impact on the population generally goes well beyond the boundaries of the habitat that has been directly affected.

Significant wildlife habitat is also important for proactively protecting habitat of species identified as of special concern on the SARO List under the ESA (see section 5.1.1). Protecting these areas contributes to the long-term preservation of these species; it is hoped that their species-at-risk status will not be elevated to endangered or threatened in the future.

As human development and populations increase, more pressure is placed on wildlife through encroachment and land use changes. With increased contact between people and wildlife comes a greater risk of conflicts.[37] Some of these conflicts are preventable by identifying significant wildlife habitat and ensuring that surrounding incompatible land uses are minimized.

9.3 Identification

Significant wildlife habitat frequently occurs in other natural heritage features and areas covered by policies under 2.1 of the PPS (e.g., significant wetlands). To ensure efficient planning processes, the identification and evaluation of significant wildlife habitat often are best undertaken after other natural heritage features have been identified. Where other natural heritage features and areas have been identified, a proponent may not have to identify significant wildlife habitat in these features, provided that:

- the feature(s) are already protected under official plan policies and designations;
- the ecological function of the adjacent lands of the feature(s) is evaluated and appropriate protection measures are in place so that there will be no negative impacts on the feature or its ecological function; and
- if needed, the proponent still considers the significant wildlife habitat functions of these features as part of any site assessment.

While in some cases the protection of other natural heritage features and areas may address significant wildlife habitat, planning authorities are still encouraged to identify it on a comprehensive basis (e.g., during development/review of official plans, including establishing settlement area designations) . It may still be necessary to carry out site assessments before any site-specific planning approvals are granted in order to identify other significant wildlife habitat. Recent work by the Regional Municipality of Peel to produce the Peel-Caledon Significant Wildlife Habitat Study is an example of how a comprehensive approach can be used to help identify significant wildlife habitat.

---

[37] MNR works collaboratively with other ministries, agencies and municipalities to manage and reduce conflicts between people and wildlife. For information, see MNR's website at http://www.mnr.gov.on.ca/en/Business/FW/2ColumnSubPage/STEL02_168419.html

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

In planning areas occurring in the Canadian Shield north of Ecoregions 5E, 6E and 7E, there are fewer categories of natural heritage features and areas requiring identification as significant under policies 2.1 of the PPS. Therefore, it is important for planning authorities in that region to define and delineate significant wildlife habitat. In areas that support high regional biodiversity (e.g., lakes and rivers) where development proposals may be focused, planning authorities are encouraged to be proactive in identifying significant wildlife habitat.

To address circumstances in which wildlife habitat is not protected by the area of other natural heritage features, MNR has provided recommended criteria for identifying wildlife habitats that should be considered significant. Planning authorities may choose to follow these guidelines or use other approaches for identifying significant wildlife habitat that achieve or exceed provincial recommendations (while still being consistent with other PPS policies). While planning authorities are ultimately responsible for identifying significant wildlife habitat, they can require development proponents to determine whether significant wildlife habitat exists on or adjacent to the property proposed for development. To support development proponents, planning authorities are encouraged to develop official plan policies outlining significant wildlife habitat identification and evaluation expectations, based on the recommended process below.

9.3.1 Significant Wildlife Habitat Technical Guide

Determining what constitutes significant wildlife habitat will vary across the province because of variation in the ecological landscapes of Ontario, and in the amount, distribution and quality of remaining habitat. Wildlife habitat that is poorly represented in one jurisdiction may be considered significant, whereas the same habitat may not be considered significant in a jurisdiction in which it is well represented. To assist with these challenges, MNR produced the Significant Wildlife Habitat Technical Guide (see appendix B.1.2), which provides more detailed technical information on the identification, description and prioritization of significant wildlife habitat. The Significant Wildlife Habitat Technical Guide was produced as a supplement to the 1999 version of the Natural Heritage Reference Manual but is still relevant for ecologists, biologists, environmental planners and others involved in assessing wildlife habitat significance.

To ensure a comprehensive approach to identifying and evaluating significant wildlife habitat, the Significant Wildlife Habitat Technical Guide describes four categories of significant wildlife habitat:

1. **Habitats of seasonal concentrations of animals:**
    - areas where animals occur in relatively high densities for the species at specific periods in their life cycles and/or in particular seasons
    - seasonal concentration areas, which tend to be localized and relatively small in relation to the area of habitat used at other times of the year
2. **Rare vegetation communities or specialized habitat for wildlife:**
    - rare vegetation communities include:
        - areas that contain a provincially rare vegetation community
        - areas that contain a vegetation community that is rare within the planning area
    - specialized wildlife habitats include:
        - areas that support wildlife species that have highly specific habitat requirements
        - areas with exceptionally high species diversity or community diversity
        - areas that provide habitat that greatly enhances species' survival
3. **Habitat of species of conservation concern:**
    - includes the habitat of species that are rare or substantially declining, or have a high percentage of their global population in Ontario
    - includes special concern species identified under the ESA on the SARO List, which were formally referred to as "vulnerable" in the Significant Wildlife Habitat Technical Guide
    - species identified as nationally endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada, which are not protected in regulation under Ontario's ESA
    - excludes habitats of endangered and threatened species covered under PPS policy 2.1.3(a)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

4. Animal movement corridors:

- habitats that link two or more wildlife habitats that are critical to the maintenance of a population of a particular species or group of species
- habitats with a key ecological function to enable wildlife to move, with minimum mortality, between areas of significant wildlife habitat or core natural areas

In the new edition of the Natural Heritage Reference Manual, the processes outlined in the Significant Wildlife Habitat Technical Guide have been modified to provide an updated approach. Specifically, this section offers a recommended process for identifying and confirming the occurrence of significant wildlife habitat.

9.3.1.1 Ecoregion Criteria Schedules

In recognition of the variability of the Ontario landscape, a draft addendum to the Significant Wildlife Habitat Technical Guide is currently being developed that provides ecoregion-specific criteria for determining the significance of wildlife habitat for Ecoregions 5E, 6E and 7E (criteria schedules for other ecoregions may be developed in the future). The draft ecoregion criteria schedules are based on expert opinion and the latest scientific literature. When the addendum is finalized, it should be considered a living document that will be updated as new information becomes available. While the draft addendum provides additional information for Ecoregions 5E, 6E and 7E, the Significant Wildlife Habitat Technical Guide is still the authoritative source for the identification and evaluation of significant wildlife habitat and should be consulted, along with the process outlined in the following pages. The draft ecoregion criteria schedules are available online (see appendix B.1.2).

9.3.2 Process for Identifying and Confirming Significant Wildlife Habitat

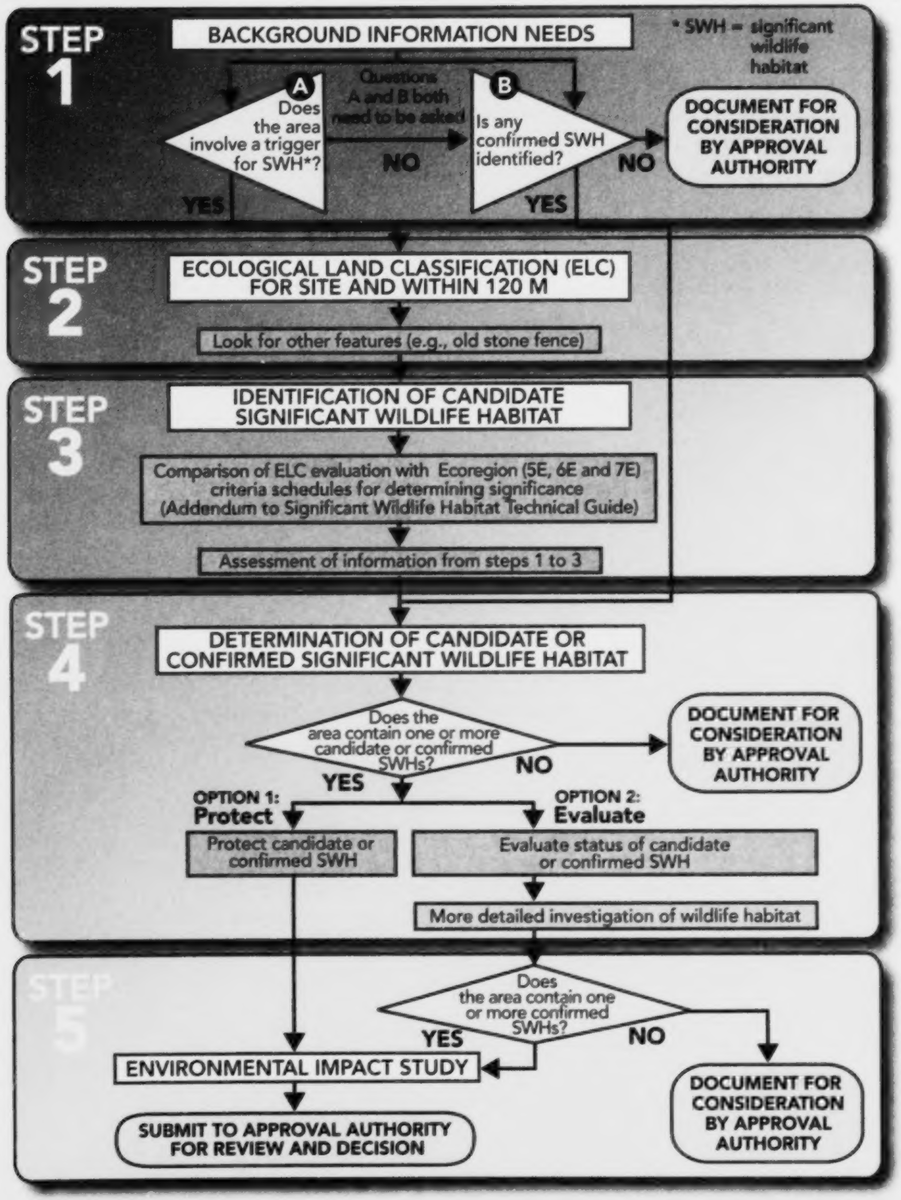
Generally, mapped significant wildlife habitat will not exist prior to a proponent submitting a development application. As a result, the planning authority should ensure that it has obtained sufficient information on which to base its planning decision by requiring proponents to complete the process steps outlined below to identify and confirm significant wildlife habitat as part of the development application.

The process outlined in figure 9-1 and discussed in the following pages will assist in identifying significant wildlife habitats as part of a development proposal. While the process steps for using the draft ecoregion criteria schedules for determining significance currently apply only to Ecoregions 5E, 6E and 7E, the other process steps can be adapted to other ecoregions and used to identify significant wildlife habitat in conjunction with the Significant Wildlife Habitat Technical Guide.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

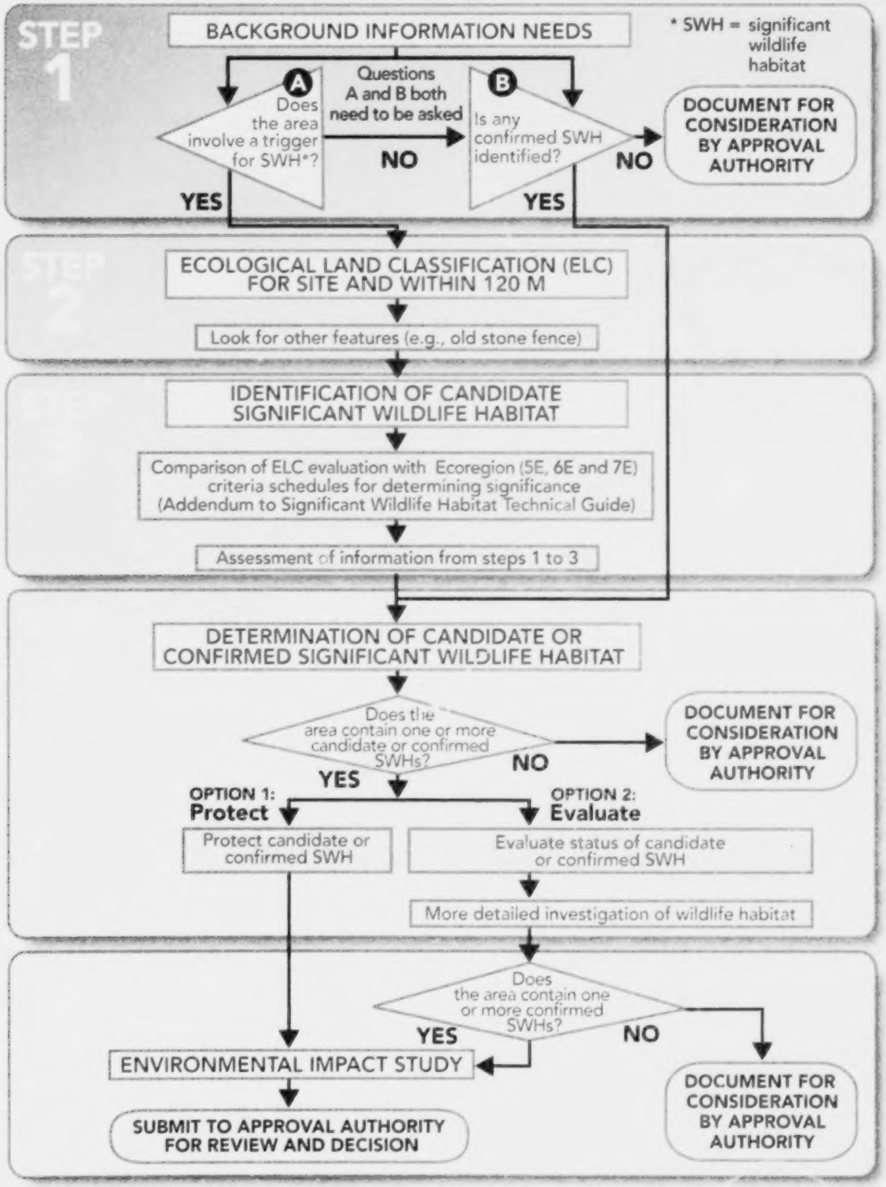
Figure 9-1: Process for Identifying and Confirming Significant Wildlife Habitat


STEP 1
BACKGROUND INFORMATION NEEDS
* SWH = significant wildlife habitat
Questions A and B both need to be asked
A Does the area involve a trigger for SWH*?
NO
B Is any confirmed SWH identified?
NO
DOCUMENT FOR CONSIDERATION BY APPROVAL AUTHORITY
YES
YES
STEP 2
ECOLOGICAL LAND CLASSIFICATION (ELC) FOR SITE AND WITHIN 120 M
Look for other features (e.g., old stone fence)
STEP 3
IDENTIFICATION OF CANDIDATE SIGNIFICANT WILDLIFE HABITAT
Comparison of ELC evaluation with Ecoregion (5E, 6E and 7E) criteria schedules for determining significance (Addendum to Significant Wildlife Habitat Technical Guide)
Assessment of information from steps 1 to 3
STEP 4
DETERMINATION OF CANDIDATE OR CONFIRMED SIGNIFICANT WILDLIFE HABITAT
Does the area contain one or more candidate or confirmed SWHs?
NO
DOCUMENT FOR CONSIDERATION BY APPROVAL AUTHORITY
YES
OPTION 1: Protect
OPTION 2: Evaluate
Protect candidate or confirmed SWH
Evaluate status of candidate or confirmed SWH
More detailed investigation of wildlife habitat
STEP 5
Does the area contain one or more confirmed SWHs?
YES
NO
ENVIRONMENTAL IMPACT STUDY
SUBMIT TO APPROVAL AUTHORITY FOR REVIEW AND DECISION
DOCUMENT FOR CONSIDERATION BY APPROVAL AUTHORITY

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Figure 9-1: Process for Identifying and Confirming Significant Wildlife Habitat


STEP 1
BACKGROUND INFORMATION NEEDS
* SWH = significant wildlife habitat
A
Does the area involve a trigger for SWH*?
Questions A and B both need to be asked
NO
B
Is any confirmed SWH identified?
NO
DOCUMENT FOR CONSIDERATION BY APPROVAL AUTHORITY
YES
YES
STEP 2
ECOLOGICAL LAND CLASSIFICATION (ELC) FOR SITE AND WITHIN 120 M
Look for other features (e.g., old stone fence)
STEP 3
IDENTIFICATION OF CANDIDATE SIGNIFICANT WILDLIFE HABITAT
Comparison of ELC evaluation with Ecoregion (5E, 6E and 7E) criteria schedules for determining significance (Addendum to Significant Wildlife Habitat Technical Guide)
Assessment of information from steps 1 to 3
DETERMINATION OF CANDIDATE OR CONFIRMED SIGNIFICANT WILDLIFE HABITAT
Does the area contain one or more candidate or confirmed SWHs?
NO
DOCUMENT FOR CONSIDERATION BY APPROVAL AUTHORITY
YES
OPTION 1: Protect
OPTION 2: Evaluate
Protect candidate or confirmed SWH
Evaluate status of candidate or confirmed SWH
More detailed investigation of wildlife habitat
Does the area contain one or more confirmed SWHs?
YES
NO
ENVIRONMENTAL IMPACT STUDY
DOCUMENT FOR CONSIDERATION BY APPROVAL AUTHORITY
SUBMIT TO APPROVAL AUTHORITY FOR REVIEW AND DECISION

Step 1 – Background Information Needs

To determine whether significant wildlife habitat or any other natural features, as described under policy 2.1 of the PPS, are present on a site, the development proponent should collect background information on the site and surrounding area as part of a preliminary ecological site assessment (see section 13.2).

The proponent will need to answer both of the following questions on the basis of the initial background information gathered:

A. Does the area involve a trigger for significant wildlife habitat?
B. Is any confirmed significant wildlife habitat identified?

Identification Triggers

While MNR can recommend criteria and a process for identifying significant wildlife habitat, the ultimate responsibility for protecting significant wildlife habitat lies with the planning authority. To ensure protection of the habitat, the planning authority will need to undertake the necessary studies or establish policies for proponents to identify and evaluate significant wildlife habitat.

To assist planning authorities or proponents in identifying significant wildlife habitat, the Province recommends that evaluation of such habitats be instigated when lands located beyond the boundary of a settlement area (see "settlement areas" definition in the PPS) are subject to one or more of the following triggers:

- creation of more than three lots through either consent or plan of subdivision;
- change in land use, not including the creation of a lot, that requires approval under the Planning Act;
- shoreline consent along a large inland lake, small inland lake or large river (denoted on 1:50,000 National Topographic System maps as being two lined) that is within 120 metres along the shoreline of an existing lot of record or a lot described in an application for subdivision or consent; and
- construction for recreational uses (e.g., golf courses, serviced playing fields, serviced campgrounds and ski hills) that require large-scale modification of terrain, vegetation or both.

For undeveloped portions of settlement areas that were delineated without a natural heritage inventory and analysis, a planning authority should consider applying the process, including the identification triggers, for identifying and confirming significant wildlife habitat.

When assessment of significant wildlife habitat is triggered, the identification and evaluation of significant wildlife habitats should, where possible, be based on documented evidence of the use of a particular habitat. In some situations, habitat assessments or inventories may be required. In other situations, it may be appropriate to use habitat-modelling techniques to evaluate significant wildlife habitat.

Confirmed Significant Wildlife Habitat

Confirmed significant wildlife habitat consists of areas identified in existing planning documents such as official plan schedules. The planning authority or the proponent should review existing planning documents to determine whether existing confirmed significant wildlife habitat is present.

Potential Outcomes

In response to questions A and B in step 1, the proponent needs to determine which of the following potential outcomes for the proposed development site or adjacent lands will occur:

- If, in response to question A, the proponent determines that the proposed development site or adjacent lands do not involve a trigger for significant wildlife habitat **and**, in response to question B, determines that there is no candidate or confirmed significant wildlife habitat, then no further action is required, and the proponent should submit this information to the appropriate planning authority for consideration.

DOCUMENT FOR CONSIDERATION BY APPROVAL AUTHORITY

- If, in response to question A, the proponent determines that the proposed development site or adjacent lands do involve a trigger for significant wildlife habitat and, in response to question B, determines that there is candidate or confirmed significant wildlife habitat, then the proponent should continue through step 2 to address the triggers and the candidate or confirmed significant wildlife habitat in step 4.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

- If, in response to question A, the proponent determines that the proposed development site or adjacent lands do involve a trigger for significant wildlife habitat and, in response to question B, determines that there is no candidate or confirmed significant wildlife habitat, then the proponent should continue through step 2 and address the candidate or confirmed significant wildlife habitat in step 4.
- If, in response to question A, the proponent determines that the proposed development site or adjacent lands do not involve a trigger for significant wildlife habitat and, in response to question B, determines that there is candidate or confirmed significant wildlife habitat, then the proponent should proceed to step 4.

Step 2 – Ecological Land Classification for Site and within 120 metres

The next step is to classify the habitats in the proposed development area. The proponent should identify and delineate ELC community series or ecosites on the property site and on adjacent lands (lands within 120 m of the proposed development or site alteration). This can be done through a mapping, aerial photographing and/or geographic information system (GIS) exercise, and may require a site visit to verify the classifications. The classification approach used will depend on where in the province the development is proposed to occur.

In southern Ontario (Ecoregions 6E and 7E), habitats should be classified to the finest ELC level practical (preferably at least to ecosite). In more northern regions (including Ecoregion 5E), Forest Ecosystem Classification (FEC) should be determined in forested habitats. The FEC system covers only forested habitats and some forested wetlands. Every effort should be made to use the southern Ontario ELC manual to identify ecosites in non-forested northern habitats (e.g., sand barrens, rock barrens, prairie, alvar, beach/bar, cultural communities). An alternative guide, Terrestrial and Wetland Ecosites of Northwestern Ontario, can also be used but is less suitable because it is not as detailed as the southern ELC system (see appendix B.1.2).

Step 3 – Identification of Candidate Significant Wildlife Habitat

This step is designed to help determine whether a candidate significant wildlife habitat exists and uses the habitat classification from the previous step to compare the ecosite classes with those indicated in the draft ecoregion criteria schedules for Ecoregions 5E, 6E and 7E.[38] Each of these schedules indicates the potential for a specific type of significant wildlife habitat to exist within a given ecoregion. A positive match will identify a candidate significant wildlife habitat where more detailed evaluation is required to confirm the status/location of a significant wildlife habitat.

In step 3, the criteria to be applied when determining the significance of wildlife habitat will vary depending on in which ecoregion or ecosite the proposed development occurs. For example, Ecoregion 7E (southwestern Ontario) is characterized by small woodlots in an agricultural landscape, whereas the Ecoregion 5E (central Ontario) landscape has less agriculture and more forested area.

Once the criteria have been applied and candidate significant wildlife habitat have been identified (if they exist), the proponent should proceed to step 4.

Step 4 – Determination of Candidate or Confirmed Significant Wildlife Habitat

If the proponent determines at the beginning of step 4 that there is no candidate or confirmed significant wildlife habitat on the proposed development site or adjacent lands, then no further action is required. The proponent should submit this information to the appropriate planning authority for consideration.

DOCUMENT FOR CONSIDERATION BY APPROVAL AUTHORITY

If the proponent determines at the beginning of step 4 that one or more candidate or confirmed significant wildlife habitats are present on the proposed development site or its adjacent lands, then the proponent should continue through the step 4 options.

---

[38] For areas outside of these ecoregions, the identification of candidate significant wildlife habitat will be based on a qualified professional's judgment.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Option 1: Protect Candidate or Confirmed Significant Wildlife Habitat without Further Study

If the decision is made to protect the area of candidate or confirmed significant wildlife habitat, there is no requirement to perform further studies to confirm the presence of significant wildlife habitat. The proponent should proceed to step 5.

If the planning authority's decision is to protect confirmed significant wildlife habitat, the planning authority needs to ensure that it has sufficient information on the status, location and nature of the habitat to enable adequate protection. If the decision is to protect candidate significant wildlife habitat, protection should be to the level that would be required if the habitat had been confirmed as significant.

Option 2: Evaluate Status of Candidate or Confirmed Significant Wildlife Habitat

The proponent may choose to refine or verify the status of the candidate habitat or confirmed significant wildlife habitat. The proponent must provide a more detailed ecological site assessment to confirm the status, location and nature of the candidate or confirmed significant wildlife habitat, based on the following requirements:

1. more detailed mapping of vegetation cover (i.e., ELC or FEC), water-related features, topographic elements in the site, and boundaries of a candidate significant wildlife habitat
2. more detailed investigation of the location and population of wildlife species that occupy a candidate significant wildlife habitat
3. studies of disruption to movement patterns, key life cycle patterns and adjacency effects, and how these may affect species within the candidate significant wildlife habitat
4. where the study requires confirmation of the presence or absence of certain species, confirmation, obtained in co-operation with the planning authority, of the timing, frequency and nature of the fieldwork

On completion of the more detailed investigation of wildlife habitat, as part of proceeding to step 5 the proponent will need to demonstrate (through the work of a qualified professional) whether the area does or does not meet the minimum criteria outlined by the draft ecoregion criteria schedules.

Step 5 – Environmental Impact Study

Does the area contain one or more confirmed significant wildlife habitats?

If the candidate significant wildlife habitat is not confirmed as significant wildlife habitat or a previously confirmed significant wildlife habitat is determined not to be significant, the proponent should document the findings and refer them to the planning authority for consideration of the proponent's recommendations.

DOCUMENT FOR CONSIDERATION BY APPROVAL AUTHORITY

If the candidate significant wildlife habitat is confirmed as significant wildlife habitat or the status of confirmed significant wildlife habitat is refined, then the proponent will need to identify the significant features, functions and attributes that define the area as a confirmed significant wildlife habitat as part of carrying out an EIS.

Where the decision has been made in step 4 to protect confirmed significant wildlife habitat, or candidate significant wildlife habitat has been verified or accepted in steps 4 and 5 as confirmed, the proponent would then undertake an EIS (see section 13) to demonstrate that there will be no negative impacts on the significant wildlife habitat or its ecological functions. If the significant wildlife habitat can be protected from the impacts of the proposed development or site alteration, protection may include the establishment of a buffer (see section 4.5). As part of completing an EIS, the proponent will need to do the following:

1. determine whether the area possesses the essential features and attributes to be defined as a confirmed significant wildlife habitat
2. determine the outside boundaries (which may include appropriate adjacent lands width), for the significant wildlife habitat
3. identify the significant features, functions and attributes that define the area as a confirmed significant wildlife habitat
4. undertake an evaluation of the impacts, assess the appropriateness of the development proposal, recommend modifications if necessary, and recommend mitigation techniques needed to ensure that no negative impact occurs on the significant wildlife habitat

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The Significant Wildlife Habitat Decision Support System, which supports the Significant Wildlife Habitat Technical Guide, is a computer-based tool that can assist proponents in carrying out an EIS. The decision support system identifies mitigation measures for a planning authority to consider when reviewing proposals and impact studies or when establishing conditions of approval, and for a proponent to consider when working in or adjacent to a significant wildlife habitat. The decision support system is available online (see appendix B.1.2).

Once the EIS is completed, the proponent should submit the documentation to the appropriate planning authority for its review and decision.

SUBMIT TO APPROVAL AUTHORITY FOR REVIEW AND DECISION

9.4 Adjacent Lands

PPS NATURAL HERITAGE FEATURE	ADJACENT LANDS WIDTH (distance from feature for considering potential negative impacts)
Significant wildlife habitat	120 m

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a development proposal must be addressed. The Province recommends that adjacent lands are those within a minimum of 120 metres of significant wildlife habitat (see section 4.4.1). As stated earlier, the Significant Wildlife Habitat Decision Support System is an important tool for a planning authority or proponent when working in or adjacent to significant wildlife habitat. This tool can help identify mitigation measures to consider when reviewing proposals and impact studies or when establishing conditions of approval (see appendix B.1.2).

In certain circumstances, the adjacent lands width will need to be expanded beyond the recommendations provided in the manual, and in some cases those expanded adjacent lands widths will require a buffer to cover the entire area (see section 4.5). Planning authorities may wish to consider the following factors in determining alternative adjacent lands widths associated with significant wildlife habitat:

- potential for impacts during the construction phase of the development (e.g., type of construction activity, vegetation removal, time of year [relating to wildlife species' activities])
- sensitivity of the species using the significant wildlife habitat
- maintenance of the identified wildlife and their habitats
- potential impacts on wildlife species using the significant wildlife habitat after the development is completed (e.g., change in microclimate; increase in nutrients or contaminants; increased traffic, light, noise and predation by pets; introduction of non-native plant species; further removal of vegetation)
- potential for mitigation of temporary and long-term impacts

Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions (see section 4.4.2). In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on significant wildlife habitat from incompatible development (see section 13).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The Significant Wildlife Habitat Decision Support System, which supports the Significant Wildlife Habitat Technical Guide, is a computer-based tool that can assist proponents in carrying out an EIS. The decision support system identifies mitigation measures for a planning authority to consider when reviewing proposals and impact studies or when establishing conditions of approval, and for a proponent to consider when working in or adjacent to a significant wildlife habitat. The decision support system is available online (see appendix B.1.2).

Once the EIS is completed, the proponent should submit the documentation to the appropriate planning authority for its review and decision.

SUBMIT TO APPROVAL AUTHORITY FOR REVIEW AND DECISION

9.4 Adjacent Lands

PPS NATURAL HERITAGE FEATURE	**ADJACENT LANDS WIDTH** (distance from feature for considering potential negative impacts)
Significant wildlife habitat	120 m

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a development proposal must be addressed. The Province recommends that adjacent lands are those within a minimum of 120 metres of significant wildlife habitat (see section 4.4.1). As stated earlier, the Significant Wildlife Habitat Decision Support System is an important tool for a planning authority or proponent when working in or adjacent to significant wildlife habitat. This tool can help identify mitigation measures to consider when reviewing proposals and impact studies or when establishing conditions of approval (see appendix B.1.2).

In certain circumstances, the adjacent lands width will need to be expanded beyond the recommendations provided in the manual, and in some cases those expanded adjacent lands widths will require a buffer to cover the entire area (see section 4.5). Planning authorities may wish to consider the following factors in determining alternative adjacent lands widths associated with significant wildlife habitat:

- potential for impacts during the construction phase of the development (e.g., type of construction activity, vegetation removal, time of year [relating to wildlife species' activities])
- sensitivity of the species using the significant wildlife habitat
- maintenance of the identified wildlife and their habitats
- potential impacts on wildlife species using the significant wildlife habitat after the development is completed (e.g., change in microclimate; increase in nutrients or contaminants; increased traffic, light, noise and predation by pets; introduction of non-native plant species; further removal of vegetation)
- potential for mitigation of temporary and long-term impacts

Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions (see section 4.4.2). In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on significant wildlife habitat from incompatible development (see section 13).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

10.0 SIGNIFICANT AREAS OF NATURAL AND SCIENTIFIC INTEREST

10.1 Policy Explanation

> 2.1.4 *Development* and *site alteration* shall not be permitted in: …
>
> e) *significant areas of natural and scientific interest*
>
> unless it has been demonstrated that there will be no *negative impacts* on the natural features or their *ecological functions.*
>
> 2.1.6 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4 and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions.*
>
> **Provincial Policy Statement 2005, policy 2.1**
> *Italics indicate terms further defined in the PPS*

> **Areas of natural and scientific interest (ANSI):** means areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education.
>
> **Provincial Policy Statement 2005, 6.0 Definitions**
> *Italics indicate terms further defined in the PPS*

To be consistent with policies 2.1.4(e) and 2.1.6 of the PPS, planning authorities shall protect those representative segments of Ontario's biodiversity, natural landscapes and geological features that have been identified as ANSIs by:

- not permitting development and site alteration in a significant ANSI unless it has been demonstrated that there will be no negative impacts on the feature or its ecological function; and
- not permitting development and site alteration on adjacent lands unless the ecological function has been evaluated and it is demonstrated that there will be no negative impacts on the feature or its ecological function.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

10.2 Why Protect?

MNR identifies two types of ANSIs (life science and earth science) on the basis of scientific surveys of the province's ecodistricts. Because these identified ANSIs are a critical complement to provincial parks and conservation reserves, such ANSIs represent important natural features that are not found in protected areas.

Life science ANSIs are significant representative segments of Ontario's biodiversity and natural landscapes, including specific types of forests, valleys, prairies, savannahs, alvars and wetlands, their native plants and animals, and their supporting environments. They contain relatively undisturbed vegetation and landforms, and their associated species and communities. Provincially significant life science ANSIs include the most significant and best examples of the natural heritage features in the province, and many will correspond to other significant features and areas such as wetlands, valleylands and woodlands.

Earth science ANSIs are geological in nature, consist of some of the most significant representative examples of the bedrock, fossils and landforms in Ontario, and include examples of ongoing geological processes.

ANSIs play an important role in the protection of Ontario's natural heritage, since they best represent the full spectrum of biological communities, natural landforms and environments across Ontario outside of provincial parks and conservation reserves. In addition, ANSIs provide a focus for both public and private sectors to contribute to the protection of Ontario's natural heritage.

10.3 Identification

MNR ranks ANSIs as being provincially, regionally or locally significant. To date, more than 500 of these areas have been identified across the province. For the purposes of policies 2.1.4(e) and 2.1.6 of the PPS, significant ANSIs include only ANSIs identified as provincially significant. Although ANSIs identified as regionally or locally significant are not included in the PPS definition, information about such ANSIs can still support the development of natural heritage systems under policy 2.1.2 (see section 3) or identification of significant wildlife habitat under policy 2.1.4 (see section 9). Recognizing the importance of regionally or locally significant ANSIs, some municipalities have provided protection through their official plan policies.

Provincial-level ANSIs that MNR has identified and recommended for protection but that have not been formally confirmed through a confirmation procedure are referred to as "candidate ANSIs." For the purposes of the PPS, an ANSI is not considered provincially significant until it has been confirmed. Additional candidate ANSIs may be identified at any time, and it is recommended that planning authorities consult the most recent information on the status of ANSIs (see appendix B). Planning authorities may choose to protect candidate ANSIs as locally or regionally significant natural heritage features and areas as per the PPS definition for "significant" (see section 4.3).

10.3.1 Life Science and Earth Science Frameworks

The selection and evaluation of life science or ecological resources are based on a life science framework that adopts a hierarchical approach for organizing ecological diversity on the basis of major ecological divisions in Ontario. Ontario's ELC system has updated the ecological divisions used in the framework, and ANSI identification is currently based on ecoregions (referred to as "site region" in the framework) and ecodistricts (referred to as "site district" in the framework). Within a particular ecodistrict, finer-scale ecological units are used to determine the features and areas (e.g., landforms, vegetation communities) that should be represented.

Earth science targets are based on an earth science framework that defines earth science features as the physical elements of the natural landscape, created by geological processes and distinguished by their stratigraphy and topography. Typical or representative features are identified using lithologic, paleontologic and geomorphic classifications systems. These features are then organized into geological themes on the basis of their age and formational environment.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The best representative sites that do not occur within national parks, provincial parks or conservation reserves are considered to be provincially significant ANSIs. Other sites that also provide next best representation may be identified as regionally significant or locally significant ANSIs.

The following five selection criteria, which are similar for both life science and earth science ANSIs, are used to evaluate potential ANSIs:

1. Representation – the representation of geological themes or landform-vegetation features in an ecodistrict
2. Condition – existing and past land uses, which are used to assess the degree of human-induced disturbances
3. Diversity – the number of assessed high-quality, representative features that exist within a site
4. Other ecological considerations – ecological and hydrological functions, connectivity, size, shape, proximity to other important areas, and so on
5. Special features – for example, populations of species at risk, special habitats, unusual geological or life science features, and educational or scientific value

A number of considerations are important in deciding how many ANSIs are required to meet representation targets in an ecodistrict. Usually several major landform types are present in an ecodistrict, each with distinctive vegetation patterns. As a result, there may be several landform-vegetation themes in each ecodistrict. On the basis of these considerations, an ANSI would be selected to represent each of these themes for an ecodistrict.

In some ecodistricts, large areas may be covered by a particular landform type, and its features may be poorly represented or lacking in existing protected areas. In such cases, more than one provincially significant life science ANSI may be selected to represent the range of site conditions and biotic communities associated with a landform. This is especially the case in southern Ontario, where landscape fragmentation has often eliminated opportunities to represent entire landscape segments in a single ANSI.

Where more than one life science ANSI is selected, each will contain complementary natural features of the ecodistrict. They fulfill the five selection criteria noted above and may contain one or more of the following considerations: examples of vegetation communities, concentrations of special features, or significant ecological functions.

Similarly, for earth science evaluations, the number of elements or features identified to represent a theme depends largely on the spatial distribution of the theme and its complexity. Some bedrock themes are so restricted that only a few sites are identified on the ground. Themes related to glacial time cover large portions of the province and many important sites are required to define them. The five factors described above assist in choosing representative elements of each theme.

With the satisfactory completion of site selection and evaluation, reports are finalized subjected to a confirmation procedure, which provides a consistent approach and science support for land use planning. A confirmed ANSI recognizes MNR's interest in and commitment to the conservation of the identified features and values (earth science and life science).

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

10.4 Adjacent Lands

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a development proposal must be addressed. The extent of adjacent lands may vary, depending on such factors as hydrology, topography, soil conditions, potential disruption of wildlife movement patterns, adjacent land uses and other features.

Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions (see section 4.4.2). In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on ANSIs from incompatible development (see section 13).

PPS NATURAL HERITAGE FEATURE	ADJACENT LANDS WIDTH (distance from feature for considering potential negative impacts)
Significant areas of natural and scientific interest – life science	120 m
Significant areas of natural and scientific interest – earth science	50 m

The Province recommends that adjacent lands are those lands within 120 metres of a life science ANSI and within 50 metres of an earth science ANSI. These distances are recommended on the basis of considerations related to, among other things, protecting typical woodland edges, riparian vegetation and wildlife habitats, as well as unusual and distinctive vegetation communities and geological formations for which the ANSI may be identified (see section 4.4.1).

Earth science ANSIs are generally less sensitive to development and site alteration than life science ANSIs and as a result have a smaller adjacent lands width. Evaluation of adjacent lands and the earth science ANSI should focus on the need to retain the educational, scientific and interpretive value of the area and features in question. Appropriate land uses are generally those that conserve topography, stratigraphic exposures and other geologically defining features for which the area was identified.

Site-specific evaluations based on the considerations noted above may demonstrate the need for greater or lesser distances for adjacent lands widths. It is recommended that MNR be consulted before any decisions relative to potential impacts on both confirmed and candidate earth science and life science ANSIs occur.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

10.4 Adjacent Lands

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a development proposal must be addressed. The extent of adjacent lands may vary, depending on such factors as hydrology, topography, soil conditions, potential disruption of wildlife movement patterns, adjacent land uses and other features.

Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions (see section 4.4.2). In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on ANSIs from incompatible development (see section 13).

PPS NATURAL HERITAGE FEATURE	**ADJACENT LANDS WIDTH** (distance from feature for considering potential negative impacts)
Significant areas of natural and scientific interest – life science	120 m
Significant areas of natural and scientific interest – earth science	50 m

The Province recommends that adjacent lands are those lands within 120 metres of a life science ANSI and within 50 metres of an earth science ANSI. These distances are recommended on the basis of considerations related to, among other things, protecting typical woodland edges, riparian vegetation and wildlife habitats, as well as unusual and distinctive vegetation communities and geological formations for which the ANSI may be identified (see section 4.4.1).

Earth science ANSIs are generally less sensitive to development and site alteration than life science ANSIs and as a result have a smaller adjacent lands width. Evaluation of adjacent lands and the earth science ANSI should focus on the need to retain the educational, scientific and interpretive value of the area and features in question. Appropriate land uses are generally those that conserve topography, stratigraphic exposures and other geologically defining features for which the area was identified.

Site-specific evaluations based on the considerations noted above may demonstrate the need for greater or lesser distances for adjacent lands widths. It is recommended that MNR be consulted before any decisions relative to potential impacts on both confirmed and candidate earth science and life science ANSIs occur.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

11.0 FISH HABITAT

11.1 Policy Explanation

> 2.1.5 *Development* and *site alternation* shall not be permitted in *fish habitat* except in accordance with *provincial and federal requirements.*
>
> 2.1.6 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4, and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions.*
>
> **Provincial Policy Statement 2005, policy 2.1**
> *Italics indicate terms further defined in the PPS*

> **Fish habitat:** as defined in the Fisheries Act, c. F-14, means spawning grounds and nursery, rearing, food supply, and migration areas on which *fish* depend directly or indirectly in order to carry out their life processes.
>
> **Fish:** means fish, which as defined in S.2 of the Fisheries Act, c. F-14, as amended, includes fish, shellfish, crustaceans and marine animals, at all stages of their life cycles.
>
> **Provincial and federal requirements:** means … b) in regard to policy 2.1.5, legislation and policies administered by the federal or provincial governments for the purpose of the protection of *fish* and *fish habitat*, and related, scientifically established standards such as water quality criteria for protecting lake trout populations.
>
> **Provincial Policy Statement 2005, 6.0 Definitions**
> *Italics indicate terms further defined in the PPS*

To be consistent with policies 2.1.5 and 2.1.6 of the PPS, planning authorities shall protect fish habitat by:

- not permitting development and site alteration in fish habitat except in accordance with other applicable legislation, policies and standards administered by the federal or provincial governments for the purpose of the protection of fish and their habitat;
- identifying special considerations for lands adjacent to lake trout lakes that are at development capacity on the Canadian Shield; and
- not permitting development and site alteration on adjacent lands unless the ecological function has been evaluated and it has been demonstrated that there will be no negative impacts on the feature or its ecological function.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

11.1.1 Relationship to the Fisheries Act

In Ontario, under the federal Fisheries Act federal and provincial governments and other agencies (e.g., conservation authorities) collaborate in the review of projects that may affect fish and fish habitat. PPS policy and definitions for fish and fish habitat require that the federal Fisheries Act and provincial requirements (e.g., lake trout lakes) serve as the basis for protection of fish and fish habitat. MNR and conservation authorities have a lead role in supporting planning authorities in carrying out their responsibilities under the Planning Act to identify, characterize and protect fish and fish habitat as directed by the PPS.

The protection of fish and fish habitat is a federal responsibility and is administered by Fisheries and Oceans Canada (DFO). DFO administers the federal Fisheries Act, which is the principal statute for the protection of fisheries and fish habitat in Canada. Under the Fisheries Act, no one may carry out any work or undertaking that results in the harmful alteration, disruption or destruction (HADD) of fish habitat, unless DFO or its delegated authority had authorized such impacts.

Under the provisions of the Fisheries Act, a review of fish habitat occurs only when a project that proposes work or undertakings in or near water has been defined and moves to the implementation stage (e.g., issuing of a building permit). To ensure protection of fish habitat prior to the development implementation stage, the PPS policies direct planning authorities to address fish habitat as part of planning approvals. As the lead for planning matters in Ontario for the protection of fish habitat, MNR provides technical guidance to planning authorities to promote good planning and ensure that fish habitat is proactively protected through the planning process.

To assist planning authorities and development proponents, the Fish Habitat Referral Protocol for Ontario 2009 (see section 15) has been developed which outlines the various permitting and approval roles of agencies concerned with fish habitat. For large development proposals where HADDs are likely to occur, DFO or the relevant approval agency under the Federal Fisheries Act, should be consulted early in the planning process to avoid situations that cannot be supported at a detailed design stage.

11.2 Why Protect?

Ontario has a large and diverse aquatic resource. The Province manages 24 per cent of Canada's freshwater, including 40 per cent of the Great Lakes. There are more than 35,000 inland lakes greater than 20 hectares in size, in addition to hundreds of thousands of kilometres of rivers and streams. The vast majority of Ontario's lakes, rivers, streams, ponds, wetlands and many seasonally flooded areas provide fish habitat. These diverse aquatic habitats support some of the highest fish species biodiversity in Canada but are also among those most susceptible to human-induced stresses (Chu et al., 2003).

In addition to supporting aquatic biodiversity, healthy fish communities contribute significantly to the economic and social interests of many Ontario communities, supporting subsistence and sport fisheries as well as commercial and tourism-based industries. Angling is a popular leisure activity; approximately two million anglers fish in Ontario each year, spending over 2.3 billon dollars on fishing-related expenditures (Fisheries and Oceans Canada, 2007).

Maintaining healthy fish communities also protects associated aquatic species, as well as ecological processes and aesthetic and natural values that many people consider important.

Development on sites that are located adjacent to fish habitat can directly and indirectly lead to the loss of aquatic biodiversity, for example, through the runoff of sediments and nutrients and the removal of aquatic and/or terrestrial vegetation. Shoreline development, particularly on residential lots but also at resort and condominium developments, commonly leads to shoreline alterations, installation of docks and intensive use that could cause incremental loss of fish habitat. Land use planning should identify fish habitat proactively to direct development away from these areas and protect healthy fish communities and overall aquatic biodiversity.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

11.3 Identification

Planning authorities involved in identifying fish habitat for the purposes of the PPS need to incorporate DFO direction, in addition to the Fisheries Act definition for "fish habitat":

- "Healthy and productive fish habitats require a sufficient amount of clean water; an adequate supply of food; adequate structure and cover to avoid predation; spawning areas, rearing grounds and nursery areas for larval and juvenile fish; and clear migration routes so that adult fish can reach spawning areas and move between other habitats; and
- Wise management of fish and fish habitat also involves maintaining natural ecological functions and processes" (Fisheries and Oceans Canada, 2006).

To incorporate DFO direction, habitat information is needed at both broad and detailed scales in order to consider fish habitat issues. For PPS purposes, both broadscale and detailed habitat information is needed to ensure a specific development application does not negatively affect fish habitat. This information can be captured on broadscale maps that identify waterbodies and aquatic communities across the landscape, and detailed maps that identify habitats such as spawning and nursery areas.

MNR and conservation authorities may have prepared watershed-based fisheries management plans that provide information on existing habitat and identify habitat enhancement/restoration opportunities and fish community targets for rehabilitated watercourses[39] that should be incorporated into municipal planning. In some areas of the province, particularly on large stretches of private land, fish habitat has not been characterized, and seeking supporting information on a case-by-case basis in support of planning is critical. Planning authorities should contact their local MNR district office or conservation authority for technical guidance when identifying fish habitat (see appendix B).

Where no detailed fish habitat mapping has been completed, all water features – including permanent or intermittent streams, headwaters, seasonally flooded areas, municipal or agricultural surface drains, lakes and ponds (except human-made off-stream ponds) – should initially be considered fish habitat unless it can be demonstrated to the satisfaction of the approval authority under the Planning Act that the feature does not constitute fish habitat as defined by the Fisheries Act. This could be demonstrated by means of a report from a qualified professional. If a waterbody does not constitute fish habitat, as defined by the Fisheries Act, then policy 2.1.5 of the PPS would not apply.

Development and site alteration occurring within the drainage area of a watercourse can affect fish habitat, primarily by altering the hydrological cycle (changing the amount of water infiltrating into the ground versus running across the land surface) or the quality (nutrients, suspended sediment, temperature, trace contaminants) of runoff. Good stormwater management practices can mitigate some of the impacts of runoff. Some of these issues (e.g., changes in thermal regimes), however, may be beyond the scope of an individual EIS and should be dealt with by a watershed or subwatershed study in order to account for potential cumulative impacts.

Subwatershed plans and stormwater management plans, prepared for areas undergoing development, need to ensure that the quality and quantity of waters affecting identified fish habitat are not degraded, and should incorporate where possible fish habitat features as discussed below. Guidelines for preparing these plans are discussed in the Province's Adaptive Management of Stream Corridors in Ontario and Stormwater Management Planning and Design Manual (see section 15). These plans would require municipal approval and, in some areas, conservation authority or Ministry of the Environment (MOE) approval.

---

[39] The term "watercourse" is used in a general sense and is not intended to contradict any legal (e.g., Conservation Authority Act) definitions that may apply.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

11.3.1 Broadscale Fish Habitat Features and Characteristics

It is recommended that, where possible, fish habitat be identified at a broadscale level across the planning area and incorporated into official plans.[40]

In some cases, fish habitat will have been identified as part of a watershed study, watershed-based fisheries management plan or comprehensive inventory of natural heritage features. The identification and mapping of water features and their general characteristics in all municipal watersheds will provide for effective planning and proactively protect fish habitat.

Water features generally support three major types of aquatic communities: coldwater, coolwater/mixed water and warmwater communities. The community types reflect the thermal conditions of the waterbody and are often defined by either temperature or the composition of fish and invertebrate species present. It is important to identify the thermal regime of the water feature to help evaluate the sensitivity of the fish community to potential development and site alteration impacts.

When detailed studies or assessments are not available, water features on the landscape that may provide fish habitat, as defined by the Fisheries Act, should be protected through a planning process and include these features, which are described in the following sections:

- lakes (with special consideration for lake trout lakes)
- ponds (other than human-made off-stream ponds)
- rivers and streams (including agricultural and municipal surface drains[41])
- headwaters and intermittent streams
- wetlands (particularly marshes and swamps connected to surfacewater)

11.3.1.1 Lakes

Lakes are generally classified into three major categories: coldwater lakes, coolwater lakes and warmwater lakes. Deep coldwater and coolwater lakes are located primarily on the Canadian Shield. Coldwater fish communities include species such as lake trout (see section 11.3.1.2), whitefish, ciscoes and sculpins. Walleye and northern pike are species typically found in coolwater communities.

Shallow warmwater lakes are typically found south of the Canadian Shield and support warmwater fish communities, including bass, sunfish and catfish (see section 11.3.2.1).

The different lake types provide habitat for different types of fish. What is common to all lake types, however, is that most fish species will come inshore to spawn (warmwater and coolwater species in the spring/summer, coldwater species in the fall). Larger fish species will use rocky shoals along shorelines to spawn, while smaller species will build nests on sand or vegetation. Shoreline areas also provide important nursery and feeding habitat for many species. A diversity of shoreline habitat is required to protect the physical and chemical features needed to sustain individuals, populations and communities of fishes.

11.3.1.2 Lake Trout Lakes

MNR has identified "lake trout lakes" and their drainage basins as a special fisheries resource to be considered when making land use planning decisions. MNR maintains a formal list of lakes designated for lake trout management: Inland Ontario Lakes Designated for Lake Trout Management (as amended and revised, May 2006; see section 15).

For lake trout lakes, in addition to cold water temperatures, the level of dissolved oxygen in the hypolimnion (lower water layer in thermally stratified lakes) is the most critical component of their habitat; field and laboratory research has shown the detrimental effects of low dissolved oxygen levels on lake trout. To protect habitat for adult and juvenile lake trout, MNR has adopted a mean volume weighted hypolimnetic dissolved oxygen criterion of 7 milligrams per litre to determine lakeshore development capacity on all inland lake trout lakes on the Precambrian Shield (Evans, 2007). A lake trout lake may be determined to be at capacity for shoreline development if measured oxygen is below the dissolved oxygen criterion or if modelling indicates that development of existing lots of record will cause the oxygen level to fall below the criterion.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

[40] The Town of Markham Small Streams Study is an example of a comprehensive approach to proactively identifying fish habitat features at a broadscale level for planning purposes.

[41] Construction and maintenance of most agricultural or municipal surface drains are subject to the Fisheries Act and should be identified at a broadscale level for planning purposes under the PPS. See the Fish Habitat Referral Protocol for Ontario 2009 in section 15.

On the basis of MOE's Lakeshore Capacity Assessment Handbook (see section 15), MNR recommends that generally there be no new lot creation or other planning approvals for new or more intense residential, commercial or industrial development within 300 metres of the waterbody where one of the preceding methods has determined a lake trout lake to be at capacity for shoreline development.

This recommendation is made to safeguard the water quality of the lake in terms of dissolved oxygen levels. Exceptions to the recommendation may apply in the circumstances described in the Lakeshore Capacity Assessment Handbook. Planning authorities should discuss potential exceptions and implementation requirements with their local district and MOE offices.

11.3.1.3 Ponds (other than human-made off-stream ponds)

Standing waters that are smaller than lakes are considered ponds, although the transition between lakes and ponds is loosely defined. Ponds connected to streams can provide important fish habitat that includes areas for foraging and spawning.

11.3.1.4 Rivers and Streams (including surface drains subject to the Fisheries Act)

Fish community composition and productivity in streams are primarily determined by both the watershed's physical characteristics (e.g., thermal regime of lake and rivers – see section 11.3.2.1) and the condition and health of adjacent lands beside the stream. The physical processes operating in and adjacent to the stream channel create and maintain fish habitat in streams. Depending on local valley gradient, local geological materials, flow characteristics, sediment regime and riparian structure, a stream will create specific patterns and forms (e.g., meander belts). The formation and persistence of specific stream forms and instream structures provide the specific habitat for fish and their life cycle requirements.

Understanding the watershed and its structure, composition and various functions is important for the management of its rivers and aquatic resources. Adaptive Management of Stream Corridors in Ontario (see appendix B.1.2) provides more information.

Construction and maintenance of most agricultural or municipal surface drains are subject to the Fisheries Act (see the Fish Habitat Referral Protocol for Ontario 2009 – section 15) and should be identified at a broadscale level for planning purposes under the PPS. In many cases, surface drains can provide fish habitat (Stammler et al., 2008). The vegetation along the banks of a drain, like that along natural watercourses, may play an important role in providing food and shade for water temperature regulation, as well as cover in the form of fallen branches and other accumulated vegetation.

Flooded areas of drains are preferred spawning areas for some fish species (e.g., pike during spring). Even if no fish live in a particular stretch of a drainage system at a given point in time, the watercourse does not necessarily lack fish habitat. Furthermore, water from surface drains can run into streams or lakes in which fish species are present. It is important, therefore, to consider how upstream activities along a surface drain will affect species downstream and in the natural water feature into which the drain flows.

11.3.1.5 Headwaters and Intermittent Streams

Protection of headwaters is essential to maintaining healthy streams and healthy fish communities. Headwaters are the uppermost reaches of a drainage network, often defined as where a stream begins. They are also considered the location where stream temperatures remain cool due to groundwater discharge and shade.

Headwaters can include intermittent, seasonal and low-order permanent streams and other drainage features. Some of these are used by fish only at certain times of the year, and some may contribute to fish productivity downstream even if fish do not use them directly. The beginning of the headwaters of a stream system and intermittent streams can be difficult to determine from OBM or other mapping sources. Thus, the location of these surfacewater features may be revealed only with a detailed-scale investigation.

Swale systems are ill-defined features that usually do not have defined banks. They can provide a major contribution to flow concentration from saturated portions of headwater watersheds. Some conservation authorities are now referring to these small, ill-defined, non-permanently flowing drainage features as "headwater drainage features."

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Although swale systems may not be considered to be intermittent streams or directly associated with fish habitat, they do contribute significantly to the flow regime, nutrient regime and sediment regime of watersheds and should be considered from that perspective (see Dunne and Leopold, 1978).

Intermittent (seasonal) streams provide water and sediment to downstream areas and are sources of food and nutrients to downstream streams of a higher order. Some intermittent streams contain important upwelling areas that supply cold water to downstream fish populations, even if only on a seasonal basis. Intermittent streams can generally be identified by the presence of a channel and poorly defined banks, indicating sufficient surfacewater flow to form and maintain such a channel, together with the presence of hydric soils and/or hydrophytic plants, indicating the occurrence of regular groundwater flow (see Toronto and Region Conservation Authority, 2007).

11.3.1.6 Wetlands

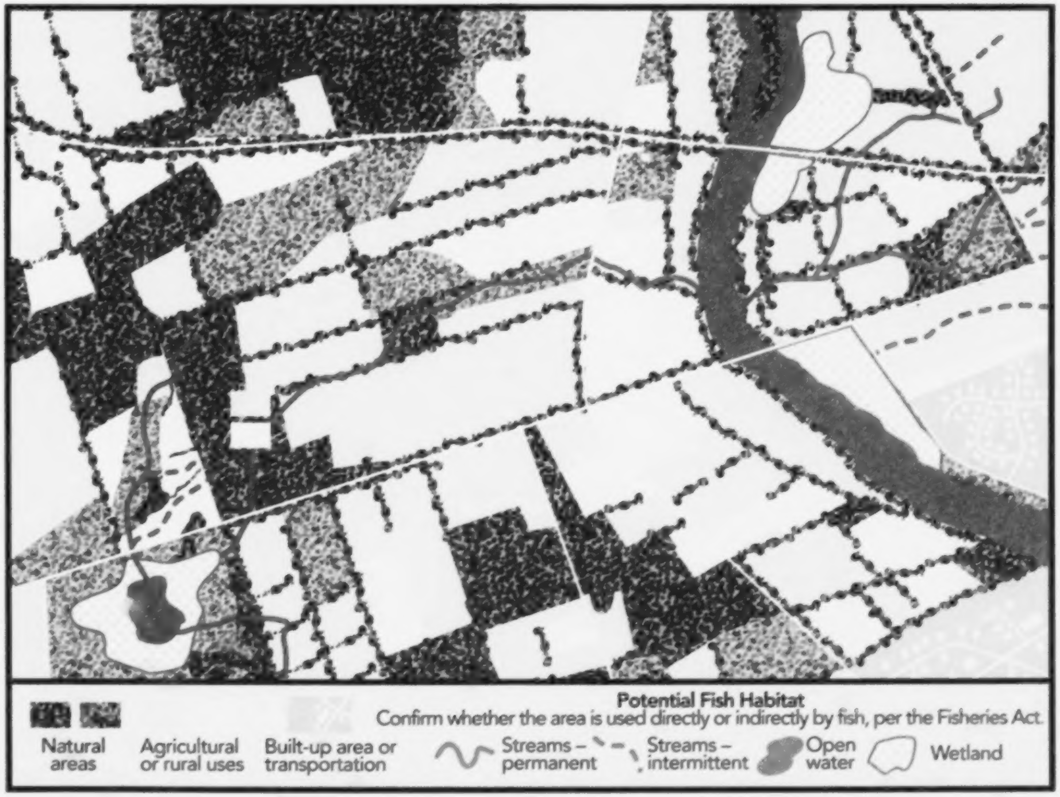
Wetland types that are seasonally or permanently covered by water (i.e., marshes, swamps and some fens) can provide fish habitat. Fish use wetlands for cover, to forage on smaller fish and for spawning. For example, northern pike may spawn in areas flooded during the spring, and wetlands are the preferred nursery, breeding and feeding habitat of muskellunge and largemouth bass. The identification of wetland areas providing fish habitat should be supported by observations made seasonally and during peak flooding.

Although the Province identifies only significant wetlands under PPS policies 2.1.3(b) and 2.1.4(a), all wetlands providing fish habitat must be protected in accordance with PPS policy 2.1.5, regardless of whether the wetland has been evaluated and/or identified as significant.

For wetlands that have been evaluated, section 4.2.6 of the OWES evaluation data record may provide useful information about the presence of fish habitat (see appendix B). For more detail on the identification and evaluation of wetlands, see section 6.

Figure 11-1 provides examples of how some broadscale water features could be identified as potential fish habitat that would then require further assessment to determine if policies 2.1.5 and 2.1.6 of the PPS would apply.

Figure 11-1: Broadscale Potential Fish Habitat Examples


Potential Fish Habitat
Confirm whether the area is used directly or indirectly by fish, per the Fisheries Act.
Natural areas
Agricultural or rural uses
Built-up area or transportation
Streams – permanent
Streams – intermittent
Open water
Wetland

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

11.3.2 Detailed Fish Habitat Features and Characteristics

Identification and mapping of fish habitat features and characteristics at a detailed scale, such as within a stream reach or intermittent stream, or along a lake shoreline segment, are needed for the review of individual development proposals. This detailed information may be available for only some watersheds, so a planning authority may need to request that proponents supply ecological site assessments to identify fish habitat as defined by the Fisheries Act. It is important, however, to consider these habitat features in the context of broader watershed objectives. For example, a stream reach classified as a warmwater one within a coldwater watershed may be degraded and a candidate for restoration, so its value for protection should not be downgraded.

Detailed site-specific fish habitat mapping and assessment are often necessary to align appropriate protection and mitigation approaches with the potential impacts of different types of development. Specifically, this detailed mapping and assessment will provide information to:

- confirm the presence or absence of fish habitat at a particular site (i.e., whether fish depend directly or indirectly on the area in order to carry out their life processes as per the Fisheries Act);
- identify intermittent and headwater streams and seasonally flooded areas that are not depicted on the broadscale maps, and determine their importance as fish habitat;
- understand the spatial and temporal habitat requirements of the various life stages of fishes at a particular site; and
- determine the sensitivity of the various types of fish habitat at a site.

When identifying fish habitat along a shoreline or proposing/reviewing shoreline development, it is important to consider that:

- most fish species will come inshore to spawn (warmwater and coolwater species in the spring/summer, coldwater species in the fall);
- some fish species will use rocky shoals along shorelines for spawning, while some species build nests on sand or deposit eggs over vegetation;
- shoreline areas also provide important nursery and feeding habitat for many species;
- areas that may provide important elements of nearshore habitats (e.g., herbaceous and woody vegetation on land that provide insects as a food source); and
- a diversity of shoreline habitat is required to protect the physical and chemical features needed to sustain individuals, populations and communities of fishes.

The review of specific development proposals often involves more detailed habitat evaluations. Potential negative impacts are dictated by the kind of development, its magnitude, its proximity to fish habitats and the nature of local fish habitats. A number of characteristics can be used to provide more detailed evaluations of habitat, including habitat functions (e.g., spawning, rearing), current and potential contribution to fish productivity, and sensitivity to development. In some instances, pathways of effect models (Jones et al., 1996) can be used to determine potential negative effects of specific developments on fish or fish habitat.

The following sections provide an overview of detailed significant fish habitat features and characteristics. Specific habitat requirements vary with the fish species present.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

11.3.2.1 Thermal Regime

The thermal regime of a waterbody is its typical summer water temperature. Waterbodies may be classified as cold, cool or warm. Thermal regime is determined using measures of water temperature and/or inferred from knowledge of the existing fish or invertebrate community present. Where thermal regime classification indicators overlap, biologists have to use their professional judgment. Thermal impacts to communities should be assessed according to preferred thermal range of the species in the community and scale of negative impact (both increases and decreases in water temperature), since all species are sensitive to thermal changes that are outside of their preferred range.

Typically, the most thermally sensitive regime will apply when determining a HADD of fish habitat. For example, in a deep oligotrophic lake where the fish community composition is lake whitefish, walleye and northern pike, the thermal regime would be classified as a coldwater one. However, for a shallow mesotrophic or eutrophic lake where stream-resident brook trout may be found in the lake near stream mouths in certain seasons of the year, the lake should be classified as either coolwater or warmwater, depending on summer water temperature and/or the resident fish community.

11.3.2.2 Spawning Habitat

Spawning habitat requirements are often species specific and can be quite varied, depending on whether the fish are riverine or lacustrine and on their thermal requirements.

Coldwater fish species generally spawn in the fall, while coolwater fish species spawn in the spring and warmwater fish species tend to spawn in the late spring and summer.

Species that spawn in flowing waters often use depositional or erosional zones near headwaters and tributaries. Preferred substrate may vary from boulders and cobble to sand or clay. For example, coldwater salmonids such as brown trout and rainbow trout or Atlantic and Pacific salmon require riffle areas for spawning, and usually spawn at the tailout of a pool or the head of a well-defined riffle.

The spawning habitat requirements of fish that spawn in lakes are quite varied. Species such as northern pike and muskellunge spawn in heavily vegetated flooded areas, while walleye prefer wave-washed rock or rubble shorelines and shoals, and bass prefer sandy, gravel or rocky lake bottoms. Lake trout spawn at shallow shoreline sites in areas of clean, coarse substrate, which are vulnerable to infilling, sedimentation and water drawdown.

11.3.2.3 Nursery Habitat

Nursery habitat can be generally defined as the habitat used by young-of-the-year fish. Typically, nursery habitat for riverine spawning species is in flowing waters in areas of low water velocity, usually along the margins of the stream, while species that spawn in lake environments often use nearshore areas as nursery habitat.

Most nursery habitat occurs in water depths of 2 metres or less. Nursery habitat is also often associated with aquatic vegetation, which provides protection from predators and also harbours prey. Thus, shallow marshes and wetlands are prime nursery habitat. Many species of fish use gravel substrates as nursery habitat, usually those species whose young remain near the spawning bed after hatching. Other substrates that fish use as nursery habitat include boulder, cobble and rubble, which provide crevices for cover.

11.3.2.4 Overwintering Habitat

During winter, riverine species generally move to deep pools or side channels where groundwater discharge is active and water velocity is continuously low. These areas provide a stable temperature and year-round growth of macrophytes for winter cover. Because these areas are often limited in size and number, fish may move great distances to them.

Lacustrine species frequently become less active during the winter and, depending on the species, will inhabit a variety of depths.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

11.3.2.5 Migration Routes

The movement of fish generally falls into one of three migration categories: trophic, refuge or reproductive:

- Trophic migrations are related to accessing habitats associated with different life stages. This would include migrating from nursery habitat to adult feeding habitat. Species that spawn in flowing water but live as adults in lakes undergo a trophic migration as juveniles from streams or rivers to the lakes into which they flow.
- Refuge migrations involve the movement of fish to inhabit water of a preferred temperature or flow. These movements are generally dictated by the environmental requirements of the species. For example, lacustrine coldwater fish species generally migrate to deeper water as water temperatures increase during the summer months.
- Reproductive migrations are undertaken to access spawning habitats. For example, many salmonid species migrate from lakes into streams and rivers to spawn.

11.3.3 Fish Habitat Classification

Fish habitat classification approaches continue to evolve and can vary from region to region. In some areas of the province, MNR has identified and classified fish habitat and mapped available information at a detailed scale. Some municipalities have incorporated this habitat typing into their official plans and by-laws, and some conservation authorities use this system to guide their development policies. Where fish habitat has been evaluated using this classification system[42] and the areas contribute directly or indirectly to fish habitat as defined by the Fisheries Act, the Province accepts it for land use planning purposes. Where there is a potential for HADD of fish habitat, an application must be made to DFO for review and approval under the Fisheries Act. Other approaches to classifying fish habitat for land use planning purposes are also valid, provided that they meet provincial and federal requirements as defined by the PPS.

11.3.4 Fish Species at Risk

PPS policy 2.1.3(a) protects the significant habitat of endangered and threatened species. Where a fish species is listed as endangered or threatened under the provincial ESA, planning authorities or proponents should follow the process outlined in section 5. MNR, as well as species experts, scientific status reports and recovery plans, should be consulted to determine the specific life history requirements and known occurrences of such species and identify significant habitats that require protection.

At the federal level, fish species may be listed under the federal Species at Risk Act. DFO is the lead agency for fish species listed under this act and directs, in cooperation with MNR and other partners, the development and implementation of recovery strategies for these species. For fish species listed both provincially and federally, efforts will be made to harmonize protection and permitting efforts.

---

[42] DFO uses a risk management framework for addressing fish habitat concerns at an implementation stage, which does not directly translate into a proactive planning approach.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

11.4 Adjacent Lands

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a development proposal must be addressed. The extent to which development or site alteration on adjacent lands may affect fish habitat, as defined by the Fisheries Act, depends on numerous factors, including the nature of development or site alterations, the sensitivity of fish habitat potentially affected and local site conditions (e.g., vegetative cover, slope, soils). Evaluating ecological functions for a feature or area and their adjacent lands is necessary only when fish depend on the habitat directly or indirectly as defined by the Fisheries Act and confirmed by a qualified professional.

PPS NATURAL HERITAGE FEATURE	ADJACENT LANDS WIDTH (distance from feature for considering potential negative impacts)
Fish habitat	inland lake trout lake on the Canadian Shield at capacity 300 m
	all other fish habitat 120 m

Determining where to measure adjacent lands widths for various features that are identified as fish habitat, as defined by the Fisheries Act, can be challenging. To assist planning authorities, the Province has provided direction (see table 11-1) for how to measure the extent of adjacent land for areas where fish habitat may be found.

Table 11-1: Recommendations for How to Measure Adjacent Lands Width for Fish Habitat

AREA WHERE FISH HABITAT FOUND	WHERE ADJACENT LANDS WIDTH IS MEASURED FROM
Lakes and large rivers	the normal high-water mark
Inland lake trout lake on the Canadian Shield at capacity[43]	the normal high-water mark[44]
Meandering stream with defined bed and banks[45]	the line that connects each outside curve/concave bank at the bankfull stage
Non-meandering stream with defined bed and banks	the normal high-water mark
Intermittent stream and drainage feature with no defined bed and banks, including headwater drainage feature	the centre line of a channel or depression that concentrates flow

---

[43] Includes other upstream waterbodies that have been determined to be at capacity on the basis of the impact that additional development would have on a downstream, at capacity lake trout lake.

[44] This does not limit the potential need to carry out lake capacity assessment on connected streams and lakes, as identified in the Lakeshore Capacity Assessment Handbook (see section 15 to access an electronic copy).

[45] The meander belt allowance concept is used for natural hazards policies under policy 3.1 of the PPS (see appendix B.1.2 for more information).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

11.4 Adjacent Lands

Adjacent lands are the lands relevant to which impacts must be considered and the compatibility of a development proposal must be addressed. The extent to which development or site alteration on adjacent lands may affect fish habitat, as defined by the Fisheries Act, depends on numerous factors, including the nature of development or site alterations, the sensitivity of fish habitat potentially affected and local site conditions (e.g., vegetative cover, slope, soils). Evaluating ecological functions for a feature or area and their adjacent lands is necessary only when fish depend on the habitat directly or indirectly as defined by the Fisheries Act and confirmed by a qualified professional.

PPS NATURAL HERITAGE FEATURE	ADJACENT LANDS WIDTH (distance from feature for considering potential negative impacts)
Fish habitat	inland lake trout lake on the Canadian Shield at capacity 300 m
	all other fish habitat 120 m

Determining where to measure adjacent lands widths for various features that are identified as fish habitat, as defined by the Fisheries Act, can be challenging. To assist planning authorities, the Province has provided direction (see table 11-1) for how to measure the extent of adjacent land for areas where fish habitat may be found.

Table 11-1: Recommendations for How to Measure Adjacent Lands Width for Fish Habitat

AREA WHERE FISH HABITAT FOUND	WHERE ADJACENT LANDS WIDTH IS MEASURED FROM
Lakes and large rivers	the normal high-water mark
Inland lake trout lake on the Canadian Shield at capacity[43]	the normal high-water mark[44]
Meandering stream with defined bed and banks[45]	the line that connects each outside curve/concave bank at the bankfull stage
Non-meandering stream with defined bed and banks	the normal high-water mark
Intermittent stream and drainage feature with no defined bed and banks, including headwater drainage feature	the centre line of a channel or depression that concentrates flow

---

[43] Includes inland lake trout lakes that have been determined to be at capacity on the basis of the impact that additional development would have on a [illegible], at capacity lake trout lake.

[44] This does not limit the potential need of a lake trout lake capacity assessment on connected streams and lakes, as identified in the Lakeshore Capacity Assessment Handbook (see section 15 to access an electronic copy).

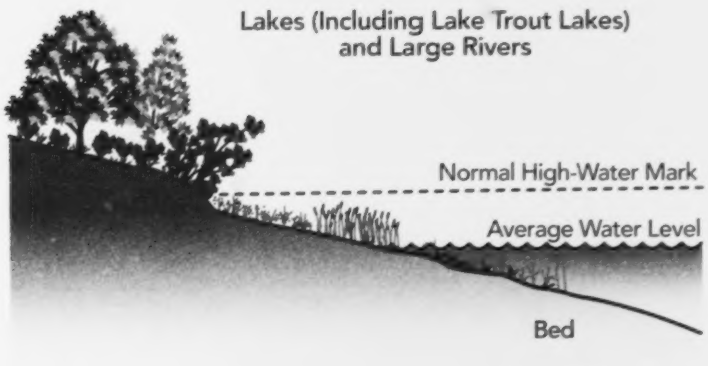
[45] The meander belt allowance concept is used for natural hazards purposes under policy 3.1 of the PPS (see appendix B.1.2 for more information).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Figures 11-2, 11-3 and 11-4 illustrate some of the concepts for measuring adjacent lands to fish habitat.

Figure 11-2: Measuring Adjacent Lands – Lakes and Large Rivers


Lakes (Including Lake Trout Lakes)
and Large Rivers
Normal High-Water Mark
Average Water Level
Bed

Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions (see section 4.4.2). In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on fish habitat from incompatible development (see section 13). Pathways of effect models (Jones et al., 1996) can assist in determining potential impacts and guide the proponent toward mitigative approaches. Planning authorities should recognize that a single specific width of adjacent lands may not be adequate to address potential impacts on fish habitat for all planning applications.

The Province recommends that the areas identified above as adjacent lands contiguous to fish habitat are the minimum needed to address the concerns listed in table 11-2. Some development proposals, however, may have the potential to affect fish habitat from a greater distance. In these cases, a larger area of adjacent lands may need to be included in the study area (see section 4.5).

Figure 11-3: Measuring Adjacent Lands – Meandering Stream with Defined Bed and Banks

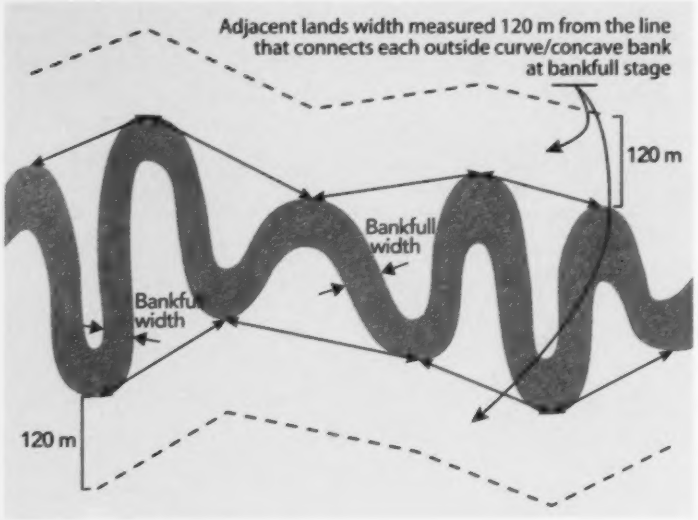
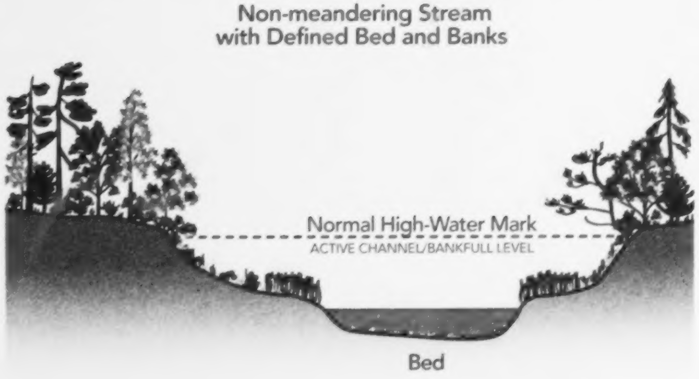

Adjacent lands width measured 120 m from the line that connects each outside curve/concave bank at bankfull stage
120 m
Bankfull width
Bankfull width
120 m

Figure 11-4: Measuring Adjacent Lands – Non-meandering Stream with Defined Bed and Banks

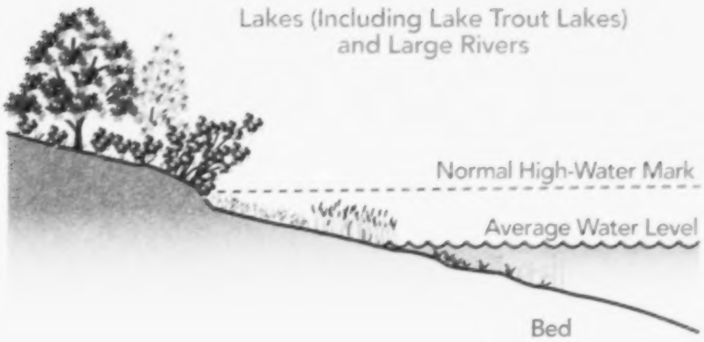

Non-meandering Stream
with Defined Bed and Banks
Normal High-Water Mark
ACTIVE CHANNEL/BANKFULL LEVEL
Bed

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Figures 11-2, 11-3 and 11-4 illustrate some of the concepts for measuring adjacent lands to fish habitat.

Figure 11-2: Measuring Adjacent Lands – Lakes and Large Rivers


Lakes (Including Lake Trout Lakes)
and Large Rivers
Normal High-Water Mark
Average Water Level
Bed

Planning authorities may define adjacent lands using a variety of approaches, depending on site-specific conditions (see section 4.4.2). In all cases, these approaches should be justified relative to the overall objective of ensuring that there will be no negative impacts on fish habitat from incompatible development (see section 13). Pathways of effect models (Jones et al., 1996) can assist in determining potential impacts and guide the proponent toward mitigative approaches. Planning authorities should recognize that a single specific width of adjacent lands may not be adequate to address potential impacts on fish habitat for all planning applications.

The Province recommends that the areas identified above as adjacent lands contiguous to fish habitat are the minimum needed to address the concerns listed in table 11-2. Some development proposals, however, may have the potential to affect fish habitat from a greater distance. In these cases, a larger area of adjacent lands may need to be included in the study area (see section 4.5).

Figure 11-3: Measuring Adjacent Lands – Meandering Stream with Defined Bed and Banks

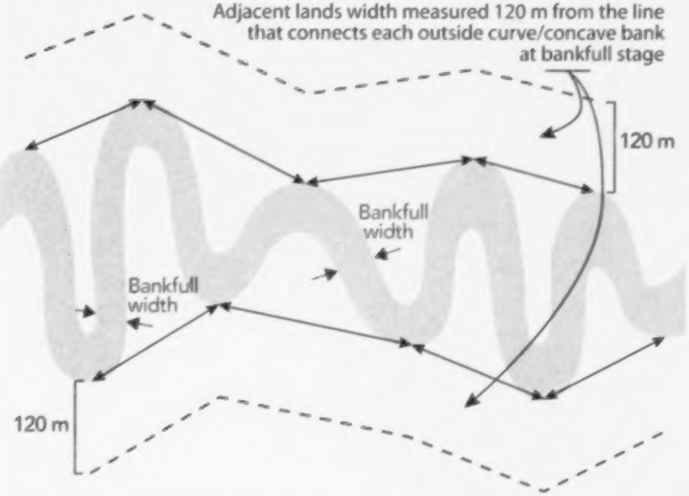
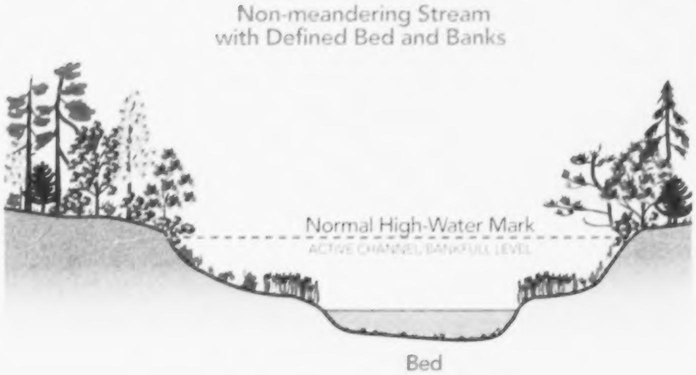

Adjacent lands width measured 120 m from the line
that connects each outside curve/concave bank
at bankfull stage
120 m
Bankfull
width
Bankfull
width
120 m

Figure 11-4: Measuring Adjacent Lands – Non-meandering Stream with Defined Bed and Banks


Non-meandering Stream
with Defined Bed and Banks
Normal High-Water Mark
ACTIVE CHANNEL/BANKFULL LEVEL
Bed

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 155
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 11-2: Fish Habitat Concerns Relevant to Adjacent Lands

CONCERN	DESCRIPTION
Increased nutrient inputs	Urbanization of watersheds and lakeshore development for residential, recreational and other uses can cause alterations to natural shorelines, wetlands and riparian areas, and can lead to increased nutrient inputs (e.g., phosphorus and nitrogen) to watercourses and lakes. Higher levels of phosphorus increase the productivity of lakes, which can lead to increased algae growth and eutrophication. These are particularly detrimental to low-nutrient oligotrophic lakes (i.e., lakes with low levels of nutrients, high dissolved oxygen levels, and typically deep areas with very cold water). Decomposition of the increased amount of algae depletes oxygen in the deep waters of these lakes, impairing fish habitat.
Sediment discharge	Development of lands adjacent to streams could discharge large quantities of sediment into the stream, over and above its typical load. When this occurs, changes in substrate quality, channel structure, habitat availability and quality, and biological communities can be expected. Some agencies consider surplus sediment to be one of the most significant polluters of rivers and streams.
Groundwater recharge areas	Since fish habitat may depend on groundwater recharge areas, adjacent lands should include recharge areas beyond the recommended distances if they occur near lakes and streams and would be a reasonable extension of the adjacent lands. Upland recharge areas, which may be very large and a considerable distance from the waterbody, would not normally be considered adjacent lands for fish habitat. PPS policy 2.2, however, highlights the need for planning authorities to identify and manage recharge areas as part of maintaining linkages and related functions among groundwater features, hydrological functions and natural heritage features and areas.
Increased impermeable surface area	Surface and groundwater quality and quantity, stream stability, and stream flows are some aspects of fish habitat that can be negatively affected by increased impermeable surface area.

Applying a case-by-case land use planning decision approach may not address cumulative effects from all development and site alteration activities (e.g., total impervious surface area) within a watershed. To address cumulative effects, stormwater management plans and subwatershed studies are also needed to manage the quality and quantity of water supporting fish habitat.

11.4.1 Riparian Areas

While not listed as a specific fish habitat water feature, riparian areas – lands adjacent to watercourses, lakes, ponds and wetlands, which are also referred to as "riparian zones" – are transitional areas between aquatic and upland habitats and as such can provide natural features, functions and conditions that support fish life processes and protect fish habitat as defined by the Fisheries Act.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Adjacent lands should be identified to encompass areas with important ecological functions, such as riparian areas. As transitional areas between aquatic and upland habitats, riparian areas represent a small percentage of most watersheds but can provide natural features, functions and conditions that support fish life processes and protect fish habitat as defined by the Fisheries Act.

To avoid potential negative impacts of development on fish habitat (see section 13 and appendix C), adjacent lands studies (e.g., EIS) should identify the exact extent of riparian area that may be set aside for no development or site alteration. MNR recommends the establishment and/or retention of natural vegetated cover (see section 4.5) for the protection of fish habitat. Based on current scientific literature (Castelle et al, 1994; Environment Canada, 2004 – see section 16). MNR-recommended minimum distances to be maintained or rehabilitated as natural vegetated cover adjacent to identified fish habitat, as defined by the Fisheries Act, are provided in table 11-3.

Table 11-3: Recommended Minimum Natural Vegetated Cover Adjacent to Fish Habitat

STREAM TYPE	RECOMMENDED MINIMUM NATURAL VEGETATED COVER ADJACENT TO FISH HABITAT
Warmwater streams	30 m or 15 m where it is demonstrated as satisfying policy 2.1.6
Coolwater streams	30 m or 20 m where it is demonstrated as satisfying policy 2.1.6
Coldwater streams, inland waterbodies on the Canadian Shield	30 m[46]

Recommendations in table 11-3 are consistent with other guidance such as the distances contained in the document Best Management Practices: Buffer Strips[47] developed by OMAFRA (2004) in partnership with the federal government and various provincial stakeholder groups. The document contains detailed approaches for the composition and design of riparian area buffer strips (i.e., area maintained or rehabilitated as natural vegetated cover) on farms that go beyond the scope of the manual but can be useful for land use planning purposes.

Planning authorities may consider the need for greater distances for natural cover for reasons such as the following:

- a water feature is highly stressed
- an endangered or threatened aquatic species is present
- enhancement of functions including detrital input, bank stabilization, pollutant removal and wildlife habitat/corridors are identified as further objectives
- another feature or area that has ecosystem-based planning importance (e.g., natural heritage system, floodplain or significant valleyland) is present

---

[46] As identified in the Lakeshore Capacity Assessment Handbook (see section 15 of this manual).

[47] The manual is not intended to detract from direction found in Best Management Practices: Buffer Strips.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

12.0 HOW TO PROTECT: MUNICIPAL PLANNING TECHNIQUES AND TOOLS

12.1 Introduction

There may be additional ways to implement the PPS beyond the approaches set out in this manual. In all cases, however, the decisions planning authorities make and comments they provide shall be consistent with the PPS.

Land use planning needs to be a dynamic process to meet the needs of constantly evolving human communities and natural communities. In particular, this emphasizes the importance of considering up-to-date information on natural heritage and on land uses that are permitted by relevant planning decisions.

Many land use planning issues, including planning for natural resources, can cross municipal boundaries.

When developing official plans and regulatory tools (e.g., zoning) aimed at managing natural heritage resources that cross municipal boundaries, municipalities should take a coordinated, integrated and comprehensive approach. Planning done at ecologically meaningful scales (e.g., watersheds, broad landforms or ecodistricts) is ideally suited to natural heritage and cross-boundary (i.e., multi-jurisdictional) interests.

The following sections outline how natural heritage features and areas can be addressed in the land use planning process, including in official plans and zoning by-laws, and how other tools can be used to achieve consistency with natural heritage policies of the PPS.[48]

12.2 Early Consultation

It is strongly recommended that proponents of a development proposal consult with the relevant planning authority, which may include the municipal office,[49] planning board and/or the MMAH municipal services office, as early in the planning process as possible. Early consultation has a number of benefits for proponents and planning authorities, such as:

- providing an opportunity to identify natural heritage information gaps or share new information that may be available;
- providing the reviewing agency with the opportunity to explain the importance of natural feature protection and expectations for ecological site assessment, supporting studies and documentation (see section 13.1);
- getting advice and information on the appropriate level of tasks (e.g., an EIS or equivalent study) that need to be undertaken; and
- where applicable, getting advice and information on Aboriginal rights and interests, as Aboriginal communities may have information and interests that are relevant and applicable to natural heritage planning.

Proponents may wish to consult with the MNR district office or other relevant agencies/organizations (e.g., conservation authorities) to obtain technical explanations of relevant data and resource considerations (see appendix B). In some cases, the precise location of a value (e.g., endangered species) cannot be identified in a planning document, because information about sensitive species should not be released; in such cases, consultation with MNR is essential.

---

[48] Plans of subdivision and consent applications present further opportunities to address natural heritage features and areas but are not discussed in the manual.

[49] Municipalities may have agreements with conservation authorities for technical review of natural heritage policies.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

12.3 Official Plans

Section 4.5 of the PPS identifies the importance of official plans for the implementation of the PPS and gives direction about matters to be addressed in official plans. PPS direction on official plans includes the identification of provincial interests and setting out appropriate land use designations and policies. Reflecting the importance of official plans, municipalities are required to update their official plans at least every five years after the plan comes into effect, as set out in the Planning Act. The five-year review of official plans provides municipalities with an opportunity to recognize newly identified provincial interests through official plan policies (including strengthening existing policies) and designations. With respect to policies 2.1 and 4.5 of the PPS, it is recommended that official plans address the following subsections to provide clear and comprehensive management and direction of physical change.

12.3.1 Goals and Objectives

Goals and objectives are statements that identify the planning authority's commitment to natural heritage systems and to the protection of natural heritage features and areas, as well as related ecological functions, from land use change that may negatively affect them.

12.3.2 Identification and Protection

Natural heritage systems, known features and areas should be identified in appropriate designations and information on land use schedules (can include overlays or other approaches as appropriate) so that users of the official plan are aware of the presence and location of these areas and their related features and functions. Official plan policies should restrict permitted uses in these areas (and adjacent lands) to existing uses and/or those uses that are compatible with the long-term protection of the natural heritage areas.

Planning authorities can use a variety of policy and mapping approaches in official plans to provide for the protection and consideration of natural heritage systems, features and areas. Examples are provided in table 12-1.

Table 12-1: Official Plan Approaches for Protecting Natural Heritage Systems, Features and Areas

OFFICIAL PLAN APPROACH	DESCRIPTION
Undertake a natural heritage inventory	• Natural features are dynamic, and thus the potential exists for natural area boundaries to change and for new natural areas to regenerate. • The status of existing features may change as new information becomes available and/or the feature changes. • Undertaking a natural heritage inventory supports the five-year review of an official plan. • A planning authority can use the information obtained from a natural heritage inventory to identify significant natural features and areas that should be incorporated into official plan mapping. • Such information could also support other comprehensive planning processes (e.g., secondary plans).

(continued on next page)

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 12-1 *(continued from previous page)*

OFFICIAL PLAN APPROACH	DESCRIPTION
Prepare policies and land use designations for natural heritage systems	• Policies should provide for the maintenance, restoration or improvement of the ecological function and biodiversity of the natural heritage system (see section 12.3.4 for more details). • Policies and depictions on land use schedules should respect working landscapes in rural and prime agricultural areas that are providing linkage functions between and among natural heritage features and areas, surfacewater features and groundwater features (e.g., a transparent shading on the schedule may better convey intangible characteristics of such linkages – see section 3.4.5). • Official plan identification can include overlays or other approaches as appropriate (see section 3.4.5).
Prepare policies and land use designations for natural heritage features and areas	• Policies should prohibit development and site alteration, as per PPS policies 2.1.3, 2.1.5 and 2.1.6, on the natural heritage features and the ecological functions for which the area is identified. • Policies should restrict new permitted uses to those where development and site alteration will have no negative impact, as per PPS policies 2.1.4 and 2.1.6, on the natural heritage features and the ecological functions for which the area is identified.
Incorporate natural heritage features and areas within a broader, less restrictive designation	• Less restrictive designations (e.g., rural) can be compatible, provided that natural heritage areas are identified as protected landscape units or at least as features that have the potential to be affected negatively by development. • Corresponding policies should require protection and impact studies, as appropriate. • Incorporation can be done in the land use schedules with natural features symbols in an existing schedule, as a separate natural features schedule, or as a natural features overlay.
Prepare policies for adjacent lands of natural heritage features and areas	• Policies should indicate that adjacent lands are areas requiring further study of their ecological functions and the demonstration of no negative impacts on the natural features or on their ecological functions if development and site alteration are to be permitted.
Prepare site plan control policies	• Municipalities may consider preparing site plan control policies that require site plan applications for all types of development[50] within or adjacent to natural heritage areas, provided that the area is designated by by-law as a site plan control area.

(continued on next page)

---

[50] Site plan control policies do not include development where site plan matters are regulated under other legislation, such as the Aggregate Resources Act.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 12-1 *(continued from previous page)*

OFFICIAL PLAN APPROACH	DESCRIPTION
Prepare policies establishing the need for background review and ecological site assessment	• An appropriate level of background review and ecological site assessment (see section 13.2) is necessary before planning decisions are made, to determine whether natural heritage features or areas are present (e.g., significant habitats of endangered or threatened species, significant wildlife habitat) on an individual property. • Policies should explain that if a natural heritage feature or area exists, a more detailed assessment will be necessary to determine the location and nature of the feature or area.
Prepare policies that require early consultation with the planning authority before submitting an application	• Policies should direct applicants to consult with the planning authority before submitting an application. • Municipalities or planning boards should support official plan policies by passing a by-law requiring applicants to pre-consult, as per clause 22 (3.1 b) of the Planning Act.
Prepare policies that specify "other information or materials" are required before an application would be considered complete	• If interested in using this tool, policies should identify what "other information or materials" are required for an applicant to submit a complete application, as permitted under the Planning Act.
Prepare policies that identify any other types of evaluations and impact assessments (including the required contents) that must be done and provided to the planning authority	• For example, policies should identify the minimum requirements for content of an EIS (or other study to demonstrate no negative impacts) required to support planning proposals. • An official plan should acknowledge that the significance of features not previously identified and inventoried will need to be evaluated so that the planning authority can make a decision that is consistent with the PPS. • An official plan should acknowledge that it may not reflect the most up-to-date information on the location and boundaries of significant features that are identified or approved by MNR as set out in the PPS. • Consider establishing the framework for defining an appropriate level for impact assessments (see section 13.2) and criteria for its use, where appropriate (e.g., single lot creation, minor variance, new building within a cluster of buildings that already encroach on adjacent lands).

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

12.3.3 Assessing Land Use Changes

Policies that provide direction on what a planning authority may require for a land use change (if permitted by the PPS) that may result in site development and alteration in or adjacent to a natural heritage feature, area or system can be included in official plans, including direction on:

- the types of approvals required (e.g., amendments to the official plan and/or zoning by-law);
- the need for early consultation with planning authority and applicable agencies to discuss issues and concerns;
- the basis on which the application will be assessed;
- the ways in which the municipality will expect and ensure that diversity and connectivity of natural features are maintained, restored or improved;
- the types and the timing of supporting information that will be required;
- the approaches to be applied for existing uses (e.g., treat as non-conforming uses and/or permit lawfully existing uses; direct expansions of existing buildings away from features or avoid introducing negative impacts, as appropriate); and
- how the review of EISs and similar studies will be handled (this may include reviews by municipal staff who are experts or through peer review processes paid for by the development proponent).

Policies should identify the type of information required, the medium in which it should be received and the justification that is expected of an applicant for a land use change. Official plans may require the applicant to:

- identify and describe (and demonstrate an understanding of) natural features and functions, including features requiring initial or further evaluations, and evaluate the function of adjacent lands, as applicable;
- identify potential impacts of the proposed land use on natural features and areas and related ecological functions;
- identify planning, design and mitigation techniques, including the width and composition of vegetated buffers, that can be employed; and
- identify the types of planning controls (e.g., zoning, site plan control, site alteration by-laws) required to ensure the necessary mitigation measures are implemented.

The approving agency often requires information in the form of an EIS or equivalent study (see section 13). Planning authorities can request that the support documentation in the EIS be tailored to the precise needs of each application on the basis of the location, the size of development and the potential for natural heritage features and areas to be present, which should be discussed as part of early consultation (see section 13.5.2).

In areas of the province where no official plans exist, amendments to zoning by-laws or zoning orders can use the PPS as the basis for assessing impacts of land use changes on natural heritage features and areas.

12.3.4 Implementation Considerations for Natural Heritage Systems

A natural heritage system approach should be applied at various scales to protect natural heritage features at the local, regional, provincial or even the national level. A natural heritage system approach at a regional level may identify natural heritage systems at mapping scales between 1:10,000 and 1:50,000 and will reflect a broad level of detail. A localized natural heritage system delineated for a secondary plan or subdivision plan will need to be mapped at a more detailed scale (e.g., 1:5,000 or greater) to accurately define limits of development.

In terms of land use planning, the most appropriate means for achieving the objectives of PPS policies 2.1.1 and 2.1.2 is through official plan policies and designations and zoning by-laws. At a local scale, planning for a natural heritage system can be incorporated into planning requirements for more detailed planning, such as a watershed, concession block or secondary plan exercise. Non-land use policy approaches are listed at the end of this section with other parts of section 12 describing tools for natural heritage protection.

Land use planning for natural heritage systems must take into account the level of protection distinctions between PPS policy 2.1.2 and policies 2.1.3, 2.1.4, 2.1.5 and 2.1.6 for natural heritage features and areas.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

As discussed in section 3.2, policy 2.1.2 allows for discretion in the ways planning authorities are to be consistent with the PPS, while other PPS policies covering features and areas require that they be identified and evaluated with associated adjacent lands for significance and protection (see section 4.2.1 and section 4.4). Thus, it is important for planning authorities to identify how and why parts of a natural heritage system warrant protection, either within the context of PPS policy 2.1 or through local and/or regional planning policies that address the conservation of biodiversity and natural features.

A natural heritage system approach generally does not eliminate the need for more detailed evaluations of specific natural heritage features or areas. Such evaluations are needed to determine whether features or areas are significant or potentially significant, and to assess how they should be protected. However, a natural heritage system approach can reduce the need for detailed natural heritage evaluations at the development application stage if municipalities choose to identify a natural heritage system, as part of an official plan or secondary plan process, where development and site alteration are restricted.

The identified natural heritage system would incorporate and protect individual features or areas regardless of their evaluation status or stand-alone significance and generally incorporate adjacent lands for these features to prevent negative impacts.

The protection of the natural heritage features and areas and the areas of adjacent lands necessary to mitigate negative impacts, as described by the PPS, will contribute to the maintenance of any natural heritage systems with which they are associated. For other aspects of natural heritage systems, and while giving consideration to other provincial planning interests,[51] planning authorities should use planning policies and other tools that promote:

- the retention of open/undeveloped areas and natural features and areas that are identified through the design process as essential components of a natural heritage system such that any subsequent land use changes do not result in the loss of these features and areas and their ecological functions;
- the identification and retention of alternative habitats and linkages when existing ones need to be or will be removed, reduced or interrupted;
- the retention of continuous open corridors between habitat patches within reasonable proximity of each other; and
- the retention, restoration and/or improvement of natural cover to buffer natural features, augment core areas and provide connectivity.

As discussed above, PPS policy 2.1.2 does not necessarily require full planning protection (i.e., to a no development or no site alteration standard) for entire natural heritage systems. Full protection, however, is more likely to be achieved when the approach includes natural heritage and other interests, involves multiple stakeholders throughout and achieves consensus among stakeholders and/or acceptance by decision makers.

Temporal considerations should also be accounted for in land use planning for natural heritage systems. Some scenarios follow to illustrate:

- A particular area of farmland in a rural area may function to some extent as a linkage between natural features, or at least it may not impede the movement of many species. This area could be included in its present form within a natural heritage system and remain that way for as long as the agricultural use remains. If in the future the area is no longer desired for agriculture and is contemplated for urban development, then its role as a linkage should be recognized and maintained, and appropriate consideration given to other provincial interests that may be relevant. Coordinated planning for prime agricultural areas and agricultural uses, along with natural heritage systems, can prevent a land use change that would impede or eliminate this ecological function (see section 3.4.5). As noted previously, this could be accomplished within an official plan using a natural heritage system overlay or a land use designation that includes agriculture as the primary use with a secondary natural heritage use.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

[51] An example of another provincial planning interest that has been given a high priority through a planning process is the achievement of density targets in built-up areas and intensification areas established in the GGH Growth Plan, under the Places to Grow Act, 2005.

- An interim use of land may be considered within parts of a natural heritage system not constituting a feature or area to be protected under PPS policies 2.1.3, 2.1.4, 2.1.5, or 2.1.6, particularly when a mechanism exists for ensuring that any lost habitat or interrupted linkage would be re-established to an appropriate condition and within an appropriate time frame.
- Implementation may also include development of a strategy for upgrading or refining information and incorporating appropriate changes in the natural heritage system.

The maintenance of natural heritage systems is an ongoing process. Natural ecosystems are dynamic and, as a result, the delineation of natural heritage systems should be updated and refined as new information becomes available. An ecological specialist can assist a planning authority and others in the delineation of natural heritage systems based on new information.

The feasibility of using land use planning to fully connect or improve the diversity and ecological function of natural heritage features and areas is affected by the social and economic context. Planning authorities are encouraged to consult and involve stewardship organizations in working with private landowners to ensure that existing or potentially restored connecting links on private land between significant features are consistent or compatible with the needs and objectives of the stewardship organizations. Planning authorities are encouraged to consult and involve stewardship organizations in working with private landowners to ensure that existing or potentially restored connecting links on private land between significant features are consistent or compatible with the needs and objectives of the stewardship organizations.

12.4 Zoning By-Laws

A zoning by-law, which must conform to the official plan, implements the objectives and policies of the official plan by regulating and controlling specific land uses. The Planning Act (para. 34(1) 3.2) empowers local municipalities to pass zoning by-laws that prohibit the use of land or the erecting, locating or using of buildings and structures within natural features and areas, as further specified in that clause.

Zoning by-laws must be updated no later than three years after the five-year review of an official plan coming into effect. This ensures that the zoning by-law is up to date with the most current official plan policies. Zoning by-laws provide the opportunity to define natural features and areas in a more precise and specific manner than an official plan or secondary plan allows.

It is important to seek up-to-date natural heritage information before zoning lands that contain or may contain natural heritage features, areas or systems, or are adjacent to natural heritage features and areas. Zoning changes undertaken as part of a comprehensive planning exercise, such as a zoning by-law update or secondary plan study, will be able to take into account information or considerations related to natural heritage features, areas and systems and cumulative effects of development on natural heritage.

A planning authority may determine what approaches both promote decisions that are consistent with the PPS and are workable in terms of the methods they use for delineating zones and approval processes under the Planning Act and Building Code Act. Various zoning by-laws that planning authorities could use are described below.

12.4.1 Natural Heritage Systems Zoning

The zoning approach for natural heritage systems will depend, in part, on the scale of planning for the system, the nature of the landscape and the extent to which the planning authority determines that the change to the control of land use is necessary to implement the official plan and be consistent with the PPS.

Lands not zoned as natural heritage features and areas (see section 12.4.2) but within the municipality's natural heritage system could be:

- zoned in a special zone or subcategory (e.g., rural natural heritage system) with an appropriate range of permitted uses that are limited to supporting low-impact activities (e.g., walking, nature study, conservation) with structural development (e.g., buildings, paved surfaces) requiring a rezoning, enabling site-specific standards and controls to be applied, as necessary;

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

- contained within a zone that permits very limited uses (e.g., uses applicable to prime agriculture areas), provided that there are policies in the official plan that ensure subsequent planning approvals would be required for a new land use;
- zoned entirely in an environmental protection zone where the delineated natural heritage system needs to be completely protected (suitable at more local scales and/or where there has been a multi-stakeholder process taking into account all relevant provincial interests); or
- identified as an area where the Development Permit System would apply through a development permit by-law and necessary official plan policies, as described in section 12.5.

Of particular relevance is the fact that the Planning Act empowers a municipality to zone an area as significant natural corridor (para. 34(1) 3.2 iii).

12.4.2 Natural Heritage Features and Areas Zoning

The design of zoning for the protection of natural heritage features and areas generally should ensure that a planning approval is required before a building permit can be issued. The planning authority will want to tailor the zoning approach to take into account the following:

1. consistency with the PPS
2. the policies of the official plan and the extent to which they provide the ability to achieve consistency with the PPS
3. the quality and accuracy of data available

The following discussion describes some possible approaches and considerations for natural heritage features and areas zoning.

Natural heritage features and areas could be placed in a zoning category that has the specific purpose of prohibiting development and site alteration. Permitted uses would support for example, environmental protection and open space. This approach assumes that the boundary of a feature described in the PPS is known or can be determined through available information sources. This may be most appropriate for the natural heritage features and areas where the PPS states that development and site alteration are not permitted (e.g., significant wetlands in ecoregions 5E, 6E, and 7E).

This approach could also be applied to other natural heritage features and areas to emphasize the protection of such features and their ecological functions, provided that the approach does not conflict with the PPS. Such zoning could also be used for lands in public ownership that are managed for natural heritage values.

It can be appropriate for the comprehensive zoning by-law to encompass the natural heritage features and areas within a zoning category that does not specifically recognize the features and areas.

In this case, it would be important for the official plan to contain policies and designations to ensure that there would be an appropriate level of ecological site assessment, evaluation of natural heritage features and areas to determine their significance, and avoidance of significant features or a demonstration of no negative impacts (see section 13.2), as the case may be, if a an application under the Planning Act were to be made. This would be most suitable when the zone would have a narrow range of permitted uses (e.g., prime agricultural areas) so that almost any type of development and site alteration would require an approval under the Planning Act, or in cases where the precise locations of natural heritage features and areas are not known or should not be revealed due to the sensitivity of species. The planning authority should be prepared to apply site-specific zoning and use other mechanisms to provide protection to natural heritage features and areas in conjunction with the approval of applications.

The use of an overlay to supplement the zoning schedules and establish provisions that would provide appropriate protection to natural heritage features and areas may be a useful approach when the zones are delineated along property lines.

Through the use of zoning standards, municipalities can establish setbacks from natural heritage features and areas. Establishing setbacks through zoning by-law text provides flexibility as information changes but may be viewed as less transparent than other approaches.

Municipalities will also have to determine the most suitable zoning approach for adjacent lands. While the approaches listed above could ensure that development and site alteration do not occur on adjacent lands as of right, some of these approaches may be found to be less than ideal for dealing with the variability of situations and the measures needed to avoid negative impacts on the natural features or on their ecological functions.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Relying on official plan policies (e.g., requiring an EIS to address potential impacts where development on adjacent lands is proposed – see section 13.5) at the application review stage may be found more suitable than using comprehensive zoning.

Uses or zoning not consistent with policy 2.1 of the PPS may currently exist on land with natural heritage features and areas, or land adjacent to those features or areas. This could be where there is a legal non-conforming use, or where the official plan or zoning by-law has not yet been updated to reflect the natural heritage feature or area.

At some point in time, as a result of the five-year review of the official plan and the related requirement to update zoning by-laws, zoning must eventually be consistent with provincial policy direction protecting the natural heritage features and areas.

Ideally, planning authorities would incorporate new information on natural heritage features and areas as soon as possible after obtaining it.

When they update their zoning by-laws, planning authorities should consider treating existing uses that are not consistent with policy 2.1 of the PPS as non-conforming uses. If the planning authority needs to zone some existing uses as permitted uses, however, such recognition should be limited to the lawfully existing uses in their existing locations. This approach should ensure that any substantive change in land use will require an amendment to the zoning by-law that, in turn, may require the studies noted above.

A further consideration is that expansions to existing buildings and structures or conversions of legally existing uses could be considered through appropriate approval processes (i.e., s. 34(10) or 45(2) of the Planning Act) if these are consistent with the PPS (e.g., policy 2.1), which would involve:

- avoiding further intrusions into significant natural heritage features and areas; or
- not introducing negative impacts on the significant natural features or areas or on the ecological functions for which they are identified.

12.4.3 Zone Standards

Provisions for lot line setbacks or minimum distances can be used to achieve appropriate locations for buildings and structures, and could, for example, contribute to buffering significant natural features and areas or to maintaining open corridors for connectivity of a natural heritage system. Where traditional zoning, as opposed to a Development Permit System, is used to implement a natural buffer, a supplementary tool such as site plan control or a Municipal Act, 2001 tool (see section 12.6) is needed to ensure protection of the vegetation. Provisions for lot coverage can be designed to limit the proportion of a site that is under impervious surfaces, promoting recharge of groundwater contributing to baseflows for fish habitat and wetlands.

Standards described here may need to be supported by the detailed review of land that is possible only on a site-specific basis.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

12.5 Site Development Controls

Site development controls are important tools that can be used in establishing measures for preventing or mitigating negative impacts on natural heritage features and areas, and for maintaining, restoring or improving natural heritage systems. To be able to use either of these tools, municipalities must have the required official plan policies and the associated by-law in effect that designates the area for site plan control. The next two sections provide examples of the use of these tools.

12.5.1 Site Plan Control

A local municipality may use site plan control (except where this power is superseded by similar powers under other legislation, such as the Aggregate Resources Act) as a tool to implement mitigation measures for development within natural heritage areas or areas adjacent to them. The type and location of sustainable design elements could be specified for the purposes of buffering or supplementing natural features and areas. Grading plans could be designed to mitigate the impacts of surface- or stormwater disposal on natural heritage features and areas.

12.5.2 Development Permit System

The Development Permit System is a new planning tool that combines zoning, site plan and minor variance processes into one application and approval process, as established through Ontario Regulation 608/06 ("Development Permits"). Once municipalities establish the Development Permit System, they can impose a range of conditions before issuing a development permit or can attach them to a development permit, provided that these conditions meet prescribed criteria.

Conditions may be applied relating to the removal or restoration of vegetation or to site alteration. These conditions could be used to protect natural heritage features and areas, to maintain or restore connectivity of natural heritage systems or to retain naturally vegetated buffers, for example, along shorelines and adjacent to wetlands. Conditions may also be applied to implement monitoring to ensure public health and safety, and protection of the natural environment.

In addition to identifying permitted uses, a development permit by-law may also identify "discretionary uses" that can be permitted (without a by-law amendment) subject to meeting specified criteria. For example, discretionary uses that meet criteria identified in the by-law can be permitted subject to conditions that ensure that the development does not negatively affect (or is compatible with) environmentally significant or sensitive areas.

12.6 Subdivision of Land

The processes associated with the subdivision of land provide several opportunities and tools to the approval authority for addressing the natural heritage policies of the PPS. First is the design stage where options for reconfiguring the subdivision layout, reducing development envelopes and increasing densities on developable portions of a site can be explored during early consultation. The aim should be to identify the areas that require protection and to adapt the subdivision plan accordingly.

Secondly, conditions of draft approval and subdivision agreements (as per s. 51 (25), 51 (26) and 53 (12) of the Planning Act) can be used to protect significant natural heritage features and areas and the connections between them, and to protect and restore native vegetation adjacent to the features. Parkland dedications could be located to mitigate the impacts of development on significant natural heritage features and areas and fish habitat. The planning authority may wish to discuss options for the use of easements or covenants to protect natural heritage with conservation organizations and proponents.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

12.7 Tree Conservation, Site Alteration and Other Municipal By-Laws

The Municipal Act, 2001
empowers municipalities to pass by-laws to:

- prohibit or regulate the injuring or destruction of trees (s. 135); and
- prohibit or regulate the placing or dumping of fill, the removal of topsoil (meaning those horizons in a soil profile commonly known as the "O" and "A" horizons, containing organic material and including deposits of partially decomposed organic matter such as peat), and the alteration of the grade of land (s. 142).[52]

The City of Toronto Act, 2006 gives the City of Toronto powers similar to those given to other municipalities (as described above), relating to:

- trees (s. 104); and
- site alteration (s. 105).

Municipalities also have general powers to pass by-laws respecting, among other things, the economic, social and environmental well-being of the municipality. See in particular:

- the Municipal Act, 2001, section 10 (single tiers) and section 11 (lower and upper tiers); and
- the City of Toronto Act, 2006, section 8.

Municipal by-laws are tools that can be used to provide protection to natural heritage features and areas in ways that cannot be achieved through some of the mechanisms available under the Planning Act or Conservation Authorities Act. An important example of the use of a site alteration by-law is in the United Counties of Prescott and Russell, where such a by-law protects the Alfred Bog PSW and ANSI.

12.8 Conservation Approaches Beyond Land Use Planning

A number of alternative planning approaches including those listed below, may assist in the protection of natural features and implementation of natural heritage systems approaches which include:

- outright purchase;
- dedication of lands to a public agency;
- private landowners' donation of lands to a public agency;
- conservation easements;
- stewardship agreements;
- the Managed Forest Tax Incentive Program;
- the Conservation Land Tax Incentive Program;
- transfer of property to a land trust;
- environmental farm plans;
- other stewardship initiatives such as tree planting, river cleanups, etc.; and
- special events to increase awareness of the importance of biodiversity conservation (public education).

To determine which approaches are appropriate, developing a natural heritage strategy for a planning area or a management plan for a natural feature or groups of features is an important step in identifying issues and responses to ensure long-term protection.

---

[52] If a regulation is made under s. 28 of the Conservation Authorities Act respecting the placing or dumping of fill, removal of topsoil or alteration of the grade of land in any area of the municipality, a municipal site alteration by-law passed under s. 142 of the Municipal Act is of no effect in respect of that area.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

13.0 ADDRESSING IMPACTS OF DEVELOPMENT AND SITE ALTERATION

13.1 Introduction

The purpose of this section is to provide a guide for assessing potential impacts of development and site alteration on natural heritage features and areas, where the PPS permits such development.[53] The PPS does not specify an EIS,[54] but an EIS is a common means of assessing impacts. "EIS" is used in the manual in a generic sense and covers any type of work undertaken to assess impacts. An appropriate level of assessment (see section 13.4) is needed where the PPS requires that development or site alteration is not permitted unless it has been demonstrated that there will be no negative impacts (as defined by the PPS) on the natural features or their ecological functions (see PPS policies 2.1.4 and 2.1.6).

Any assessment process used by planning authorities[55] should be identified in their official plan and result in planning decisions that are consistent with PPS policies and reflect the approaches recommended in this manual. If a planning authority or development proponent does not have the necessary expertise to undertake an assessment of impacts, it is strongly recommended that qualified professional consultants conduct the impact assessment.

> **Negative impacts:** means
>
> a) in regard to policy 2.2, degradation to the *quality and quantity of water, sensitive surface water features* and *sensitive ground water features*, and their related *hydrologic functions*, due to single, multiple or successive *development* or *site alteration* activities;
>
> b) in regard to *fish habitat*, the harmful alteration, disruption or destruction of *fish habitat*, except where, in conjunction with the appropriate authorities, it has been authorized under the Fisheries Act, using the guiding principle of no net loss of productive capacity; and
>
> c) in regard to other *natural heritage features and areas*, degradation that threatens the health and integrity of the natural features or *ecological functions* for which an area is identified due to single, multiple or successive *development* or *site alteration* activities.
>
> **Significant:** means … While some significant resources may already be identified and inventoried by official sources, the significance of others can only be determined after evaluation.
>
> **Provincial Policy Statement 2005, 6.0 Definitions**
> *Italics indicate terms further defined in the PPS*

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

---

[53] Where no development or site alteration, as defined by the PPS, is proposed as part of a planning application, this section does not apply.

[54] In planning documents, an EIS is also referred to by other terminology (e.g., "environmental impact assessment").

[55] Municipalities may have agreements with conservation authorities for technical review of natural heritage policies.

13.2 Determining Negative Impacts

To determine negative impacts on a significant natural heritage feature or area, the cumulative negative impacts from development or site alteration activities (e.g., impacts that adversely affect the stability of the feature and its ability to continue) must be considered against the integrity of the feature. The current and future ecological functions of the natural feature or area as they relate to the surrounding natural heritage system (e.g., connectivity) must be considered as well.

The PPS definition for "negative impacts" does not state that all impacts are negative, nor does it preclude the use of mitigation to prevent, modify or alleviate the impacts to the significant natural heritage feature or area. For example, demonstration of no negative impacts on a significant woodland through mitigation measures may be contemplated, provided that factors such as the successional status and replaceability of the woodland components and functions within a reasonable time frame (e.g., 20 years) are considered.

13.3 Determining Whether Assessment Is Required

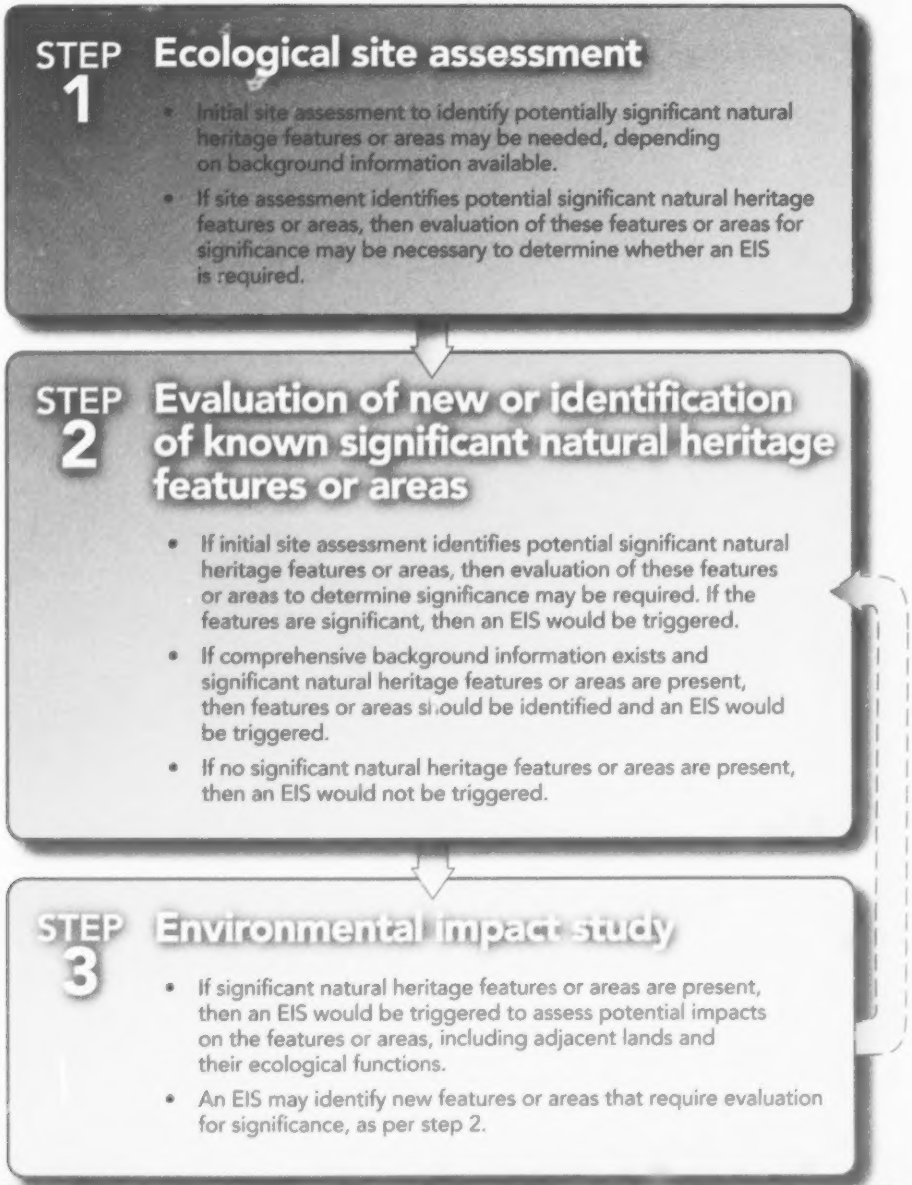
A development proponent must first establish whether its planning application will trigger the need to address the matter of negative impacts from development and site alteration on natural heritage features and areas before determining the appropriate level of assessment required as part of an EIS or equivalent study. In some cases, especially in more developed areas, information on natural heritage features may be sufficient to determine whether assessment is required. In other areas, however, determining whether an impact assessment is needed may be difficult, and site inspection (i.e., ecological site assessment) may be needed to identify potentially significant natural heritage features and areas that may require further evaluation (as per the PPS definition for "significant" – see section 4.2.1). For example, this may be the situation where there are continuous forests, large expanses of wetland and numerous lakes indicative of the natural heritage features and areas described by the PPS. If no background studies have been undertaken to determine the presence of a significant feature or area, the natural features or areas would have to be evaluated before a decision is made regarding the planning application, to ensure that the decision would be consistent with the PPS.

In the absence of natural heritage information that would trigger an assessment of negative impacts, as the PPS requires, development proponents should consult with the planning authority to determine its assessment component requirements. This should include ecological site assessment requirements, as discussed in section 5.3.1 and section 9.3.2).

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Figure 13-1 shows the process and relationship between assessment components (ecological site assessment, evaluation of new or identification of known significant natural heritage features or areas, and assessment of potential impacts).

Figure 13-1: Process for and Relationship between Impact Assessment Components



STEP 1 Ecological site assessment

- Initial site assessment to identify potentially significant natural heritage features or areas may be needed, depending on background information available.
- If site assessment identifies potential significant natural heritage features or areas, then evaluation of these features or areas for significance may be necessary to determine whether an EIS is required.

STEP 2 Evaluation of new or identification of known significant natural heritage features or areas

- If initial site assessment identifies potential significant natural heritage features or areas, then evaluation of these features or areas to determine significance may be required. If the features are significant, then an EIS would be triggered.
- If comprehensive background information exists and significant natural heritage features or areas are present, then features or areas should be identified and an EIS would be triggered.
- If no significant natural heritage features or areas are present, then an EIS would not be triggered.

STEP 3 Environmental impact study

- If significant natural heritage features or areas are present, then an EIS would be triggered to assess potential impacts on the features or areas, including adjacent lands and their ecological functions.
- An EIS may identify new features or areas that require evaluation for significance, as per step 2.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Quick Links

Figure 13-1 shows the process and relationship between assessment components (ecological site assessment, evaluation of new or identification of known significant natural heritage features or areas, and assessment of potential impacts).

Figure 13-1: Process for and Relationship between Impact Assessment Components

STEP 1 Ecological site assessment

- Initial site assessment to identify potentially significant natural heritage features or areas may be needed, depending on background information available.
- If site assessment identifies potential significant natural heritage features or areas, then evaluation of these features or areas for significance may be necessary to determine whether an EIS is required.

STEP 2 Evaluation of new or identification of known significant natural heritage features or areas

- If initial site assessment identifies potential significant natural heritage features or areas, then evaluation of these features or areas to determine significance may be required. If the features are significant, then an EIS would be triggered.
- If comprehensive background information exists and significant natural heritage features or areas are present, then features or areas should be identified and an EIS would be triggered.
- If no significant natural heritage features or areas are present, then an EIS would not be triggered.

STEP 3 [illegible]

- If significant natural heritage features or areas are present, then an EIS would be triggered to assess potential impacts on the features or areas, including adjacent lands and their ecological functions.
- An EIS may identify new features or areas that require evaluation for significance, as per step 2.

13.4 Determining an Appropriate Level of Assessment

Once it has been established that a planning application triggers the need for an impact assessment, the appropriate level of detail and effort required to assess the development impacts will vary, depending on the characteristics of the site and the proposed development. Determining an appropriate level of assessment for an EIS or equivalent study should be measured by factors that include the following:

- The assessment effort is correlated with the likelihood of a significant natural heritage feature or area being present (e.g., significant wildlife habitat is deemed to be present on the basis of factors such as the geographic range of a species or known occurrences of the species in the general area).
- The assessment effort is correlated with the level of analysis that may have occurred previously as part of a separate planning process (e.g., comprehensive studies to identify natural heritage systems and significant features and areas).
- Any field observations and investigations are scheduled to occur when the feature would be expected to be visible, if present.

In terms of the above factors, not all impact assessments have to be detailed and they may be tailored to the situation (see section 4.4.2.1). A detailed assessment is appropriate, however, in cases in which:

- the potential impacts of a proposal are unknown and a precautionary approach is needed;
- impacts on natural heritage features are likely to occur;
- appropriate impact mitigation techniques may not be readily available;
- the significance level of the natural heritage feature is high;
- the planning stage for the proposed development is advanced;
- the proposal may lead to multiple or successive development or site alteration activities; and
- the potential development would result in the elimination of a significant natural heritage feature.

In situations in which comprehensive planning studies or natural heritage systems have been completed with site level information, the need for a detailed assessment may be reduced, and a more focused assessment may provide an adequate evaluation of potential impacts. Regardless of the assessment undertaken, the level of detail must be sufficient to demonstrate that there will be no negative impacts on the natural features or their ecological functions.

Many municipalities or conservation authorities have developed guidelines for the preparation of an EIS that can be used to determine the appropriate level for the assessment of impacts and development proponents should contact their local planning authority to obtain guideline documents as part of early consultation as described in section 13.5.1.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

13.5 Impact Assessment Process

Sufficient information on a proposed development or land use change, the natural features present and their associated ecological functions is required to allow decision makers to understand the potential impacts of the proposed development or land use change. An impact assessment does not ensure that development proposals will be approved; it is simply one piece of information required to make possible informed planning decisions that are consistent with the PPS.

An impact assessment is more than a description of constraints on a property. It is an evaluation that must anticipate the implications of changes in land use and the interaction of these changes with the features and functions of an area. This requires a thorough inventory of abiotic conditions, flora and fauna; documentation of vegetation; analysis of the interrelationships among the biotic and abiotic elements of a site (i.e., its ecology); and determination of the effect the proposed changes will have on the existing conditions. Most importantly, an EIS or equivalent study must determine whether the likelihood of negative impacts (as defined by the PPS) occurring on the natural features or their ecological functions is definite or probable if the development proceeds under a given proposed design. Decision makers need this information to determine the need for modifications to proposed plans, buffers and other mitigation strategies and to fairly evaluate the cost of a land use change. Ultimately, impact assessment information is required to achieve decisions that are consistent with the PPS.

Information sources and possible techniques for describing existing environmental conditions are provided in appendix C.2.1. A sample review list for assessing development impacts is provided in appendix C.2.2. The sample review list may be used to ensure that the information needs for an impact assessment have been met, and may help streamline the approvals process.

13.5.1 Early Consultation

It is strongly recommended that the proponent consult as early in the planning process as possible with the planning authority, relevant provincial ministry or agency (e.g., conservation authority) concerning the proposed development.

Early consultation with the MNR district office and, where applicable, the local conservation authority may be useful in establishing whether the likelihood is reasonable that a natural heritage feature may exist and be affected by the proposed development.[56] The focus of MNR's role would be to provide or confirm relevant information about natural heritage features and areas (see section 4.2.1).

Although MNR does not review most impact assessments, there may be a specific need for MNR to review portions of an EIS, for example, if it contains technical information related to the significant habitat of endangered and threatened species (see section 4.2.1). While MNR is not responsible for the approval of an EIS or equivalent study, some suggestions about what should be included in an EIS are provided in section 13.5.2 and appendix C which can be used where a planning authority has not developed specific EIS requirements.

The purpose of this initial consultation is to review the development proposal and ensure that all relevant available information and issues are considered. As part of this process, the planning authority can identify the contents of an impact study if one is required. Initiating the impact study early in the planning process can inform the design of the development, thus allowing impacts to be avoided at the outset rather than necessitating modification of the design once the proposal has been finalized.

---

[56] Proponents should supply study area information (e.g., updated mapping, new natural heritage data) in a GIS format to facilitate a prompt response from the relevant provincial ministry or agency

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The initial consultation is an opportunity for planning authorities to comment on the proposal and provide initial direction on the impact assessment. For example, they can indicate whether and how the site is addressed in official plan policies, schedules and so on, or whether a comprehensive natural heritage features or areas study or natural heritage system approach (see section 3) has been prepared. Planning authorities may also be able to provide studies that contain information on the subject property. In some situations, if the development proposal is straightforward and development impacts are limited or readily mitigated, consultation with the planning authority may consist of a single meeting.

Ongoing consultation with the planning authority, affected agencies, advisory or community groups and, where applicable, Aboriginal communities provides a forum for discussion and resolution of development-related issues that may arise. Many municipalities have an environmental advisory committee that provides staff with technical advice about development applications. Development proponents are frequently required to consult with environmental advisory committees and satisfy their concerns as part of the approval process. This may include obtaining approval of the terms of reference for an EIS before undertaking it, to ensure that the most important issues are addressed.

13.5.1.1 Coordination with Other Assessment Processes

Early consultation should also identify whether other legislatively required assessment work needs to be completed. Work done through the Planning Act impact assessment process may be coordinated with work required under other legislation, including the Environmental Assessment Act, Public Lands Act, Lakes and Rivers Improvement Act, Conservation Authorities Act and the Ontario Water Resources Act. Duplicate processes are neither advocated nor recommended. Where an assessment has to be completed under other legislation, a separate assessment process may not be necessary. It is recommended that the impact assessment requirements identified in this section be dealt with through those other processes where appropriate.

13.5.2 Contents of an Environmental Impact Study

The planning authority should provide direction on the contents of an EIS or other equivalent study for impact assessment as part of the early consultation process. Where direction is unavailable, the following discussion of EIS contents, can support planning authorities and development proponents address PPS requirements for evaluating and demonstrating that there will be no negative impacts on natural features (including adjacent lands) or on their ecological functions.

13.5.2.1 Determining Information Needs

Based on early consultation to determine the appropriate level of assessment, an analysis of the information needs of the proposal should be undertaken that contains the following:

- identification of what information the planning authority requires
- identification of any previous relevant studies (e.g., subwatershed plans) and indication of how they will be addressed
- identification of gaps in the available information (e.g., lack of site-specific data, unevaluated natural heritage features or areas[57])
- assessment of methods for dealing with information gaps
- consideration of the implications of information gaps
- deliberation on the need for (further) field investigations
- indication of the appropriate time of year and methodology (e.g., monitoring protocols) for field investigations if needed
- consideration of the need for involving outside consultants who have specialized expertise

---

[57] An ecological site assessment may be required to determine whether unevaluated natural heritage features or areas are present that may require further evaluation for significance as per the PPS. Where MNR is responsible for the approval of significant natural heritage features and areas (see section 4.2.1), proponents should consult with the local MNR district office.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

13.5.2.2 Providing Background Information for the Proposed Development

As determined through discussions of information needs during early consultation, information focusing on the planning aspects and existing environmental conditions for the proposed development should be provided, which may include the following:

- planning aspects
  - description of the purpose of the proposal
  - statement of the rationale for the undertaking
  - site location, including location maps and site plans
  - alternative forms that the development might take
  - description of surrounding land uses (e.g., existing or proposed official plan designations and zoning) and ownership patterns if the proposal may lead to multiple or successive development or site alteration activities
  - site plan representations of alternative methods of development
  - description of alternative developments for the subject lands
- existing environmental conditions
  - analysis of surface and subsurface soils
  - identification of local landform types
  - identification of catchment boundaries of any surfacewater features, including wetlands
  - description of the water balance, depending on the types of features present
  - description of the infiltration capabilities of the site
  - description of natural heritage features and areas including evaluated and unevaluated features (see section 13.5.2.3)

A description of the proposed development, including draft plans, grading plans, and stormwater and servicing reports, should be part of the background information for an EIS, and the level of detail should be relevant for the stage of the proposal. The most effective way to illustrate a development proposal is to overlay the development plan on the map of existing conditions. If the proposal has advanced to the site plan stage, the description of the undertaking can provide details (e.g., lot fabric, grading plan, stormwater management ponds and their outfalls, trail design) needed to evaluate the impacts of the proposal.

Note that such details may also have been requested at the official plan amendment stage to determine whether the site is of sufficient size for the proposed undertaking, considering any constraints to development found on the site. The description of the undertaking should provide enough detail to accurately predict development impacts so that the planning authority can make an informed decision on the proposal.

13.5.2.3 Identifying and Describing Natural Heritage Features and Areas

Based on the background information work regarding existing environmental conditions, an EIS must identify and describe the significant natural features or areas that may be affected by the development proposal within the study area, at the appropriate level of detail decided through early consultation. A proponent may review, on the basis of new information, the significance of the feature(s) and their boundaries[58] and indicate whether any features should be updated and offer recommendations where appropriate.

Natural features on the site should be depicted on a map and described in accompanying text. The map should be based on an aerial photograph.[59] If an aerial photograph is unavailable, an OBM can also provide an appropriate base map. The base map used should be at a scale appropriate to the size of the development area and the surrounding features. The map scale can vary, depending on the municipality and the proposed development. Many datasets change over time as standards for accuracy and precision improve or new information is acquired. Site maps created should be based on the most recent information available (see appendix B) and depict the following:

- the location of previously or revised delineated features[60] on or within 120 metres of the site, as appropriate (e.g., ANSI and PSW boundaries, significant species and their significant habitat if delineated)

---

[58] If mapping is at a finer scale, MNR input may be needed to refine wetland and ANSI boundaries, because many of these features have been mapped at coarser scales of 1:10,000 or 1:20,000.

[59] Ortho-rectified aerial photography coverage is available for most of southern Ontario and is superior to non-ortho-rectified images and OBMs

[60] Subject to approval from the relevant planning approval authority.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

- potential fish habitat (as defined by the Fisheries Act) and vegetation communities (based on ELC mapping where possible) on the site delineated to a coarse or fine level, depending on the level of detail decided on through early consultation
- if relevant, based on potential fish habitat and vegetation mapping, newly identified fish habitat, significant habitat for endangered and threatened species or significant wildlife habitat
- the presence and location of a significant species found on the site, unless the species is a sensitive one whose location should not be revealed
- any other features considered important, for example, cliffs, bluffs, seeps and springs, as well as ponds used as breeding habitat by wetland-dependent species such as amphibians

The text description accompanying the map should provide detail on the significance of the features at a provincial, regional and local level (see section 4.3) and elaborate on habitat requirements, relationships between features or any other relevant information. It should describe the nature of adjacent offsite features that contribute to the persistence of significant features on the site (e.g., watercourses, linkages, amphibian breeding ponds and wintering habitat).

The accompanying text should document the methodologies used for any field studies that were necessary, including dates and times of visits, and information about the qualified professional carrying out the study, the protocols used and the weather during wildlife surveys, where relevant.

13.5.2.4 Analyzing Ecological Functions of Features

> **Ecological function:** means the natural processes, products or services that living and non-living environments provide or perform within or between species, ecosystems and landscapes. These may include biological, physical and socio-economic interactions.
>
> **Provincial Policy Statement 2005, Section 6.0 Definitions**
> *Italics indicate terms further defined in the PPS*

Proponents should analyze the ecological functions of significant natural heritage features or areas on the site and adjacent properties[61] that may be affected by development, including previously known features and functions, as well as those discovered during the planning process. The analysis should include the following:

- examination of the features and functions present and identification of those that are ecologically sensitive or could serve as good indicators of impacts
- explanation of the methods used to determine the effects of the proposed development
- assurance that key features or functions are measurable or predictable (e.g., functional loss can be predicted using sampling, modelling or other accepted methods; water quality in a coldwater stream can be indicated by stream temperature)
- assessment of habitat changes that generally are more meaningful than changes in the relative abundance of species using a particular habitat
- identification of indicator, keystone or flagship species that could be considered in assessing habitat conditions
- identification of key features or functions that contribute significantly to the integrity or importance of the natural heritage system, feature or function

Sections 5 to 11 of the manual describe some of the key ecological functions associated with natural heritage features and areas, and appendix C.1.1 should be used to address impacts on features and functions. It is important to note that not all of these features and functions are likely to occur in every natural heritage area, and that some may be present but be relatively unimportant.

---

[61] Without landowner permission, detailed assessment is not possible, but analysis based on aerial photography should still be undertaken if requested as part of an appropriate level of assessment by the planning authority.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

13.5.2.5 Identifying Diversity and Connectivity That Supports Natural Heritage Systems

> The diversity and connectivity of natural features in an area, and the long-term *ecological function* and biodiversity of *natural heritage systems*, should be maintained, restored or, where possible, improved, recognizing linkages between and among *natural heritage features and areas, surface water features* and *ground water features.*
>
> **Provincial Policy Statement 2005, policy 2.1.2**
> *Italics indicate terms further defined in the PPS*

To address policy 2.1.2, the EIS should assess areas within the proposed development site and, where applicable, in a landscape context supporting ecological function and biodiversity of natural heritage systems as discussed below:

- diversity
    - The first principle of Ontario's Biodiversity Strategy is "Biodiversity has ecological, economic, social, cultural and intrinsic values" (see section 15 to access an electronic copy). Studies should identify features that contribute to the genetic, species and ecosystem diversity of Ontario.
- connectivity
    - Consideration of areas that are likely to function as pathways or natural corridors, or otherwise support a functional relationship between natural heritage features and areas, is important in assessing potential development-related impacts. Potential connections could include aquatic, riparian and terrestrial linkages.
    - Aquatic linkages include intermittent and permanent watercourses, waterbodies and wetlands in the study area. Aquatic linkages can be defined using topographic information, analysis of aerial photographs, water-chemistry data, and fish community and aquatic habitat assessment data. Permanence of flow and surface and subsurface gradients relative to other aquatic and terrestrial habitats will provide information about the importance of connections between surface- and groundwater in maintaining fish and aquatic habitat.
    - Riparian linkages support and enhance the ecological functioning of aquatic features by, for example, helping to maintain water quality and thermal regime, and detaining flow in storm events.
    - Terrestrial linkages include tablelands not necessarily connected to a watercourse. These linkages provide for movement and life cycle processes of terrestrial and wetland flora and fauna. They generally link wetlands, woodlands, valleylands, wildlife habitats or other features, and may be described in terms of their characteristics (width, length and vegetation) and functions.
- natural processes
    - Processes may be physical, chemical or biological. Movement of surface- and groundwater, filtration of runoff, flow augmentation and erosion are examples of physical processes. Nutrient cycles (e.g., phosphorus inputs) are chemical processes. Biological processes include reproduction, succession and gene flow.

Property boundaries do not confine natural systems, but obtaining access to adjacent properties is often difficult. However, relevant observations pertaining to adjacent properties can usually be made from the subject property and with the aid and interpretation of aerial photographs. The study area boundaries should include the development parcel, its adjacent lands and other potentially affected areas. A site visit may be necessary to determine the boundary of the features and adjacent lands. It is suggested that the proponent and planning authority agree on the study area boundaries at the outset of the impact assessment.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

13.5.2.6 Outlining Potential Impacts

The EIS should describe potential impacts on significant natural heritage features and natural heritage systems and their ecological functions with possible mitigation measures through the following:

- evaluation of the possible extent or area of the natural feature(s) that the development will affect, directly or indirectly
- evaluation of the possible future and cumulative impacts of development that may occur as a result of demand created by the present development (i.e., whether the proposal will lead to multiple or successive development or site alteration activities)
- recommendation of actions that may be necessary to prevent, mitigate or remedy the effects of the development, as well as alternative methods to carry out the development and alternatives to the form of the proposed development

In many cases, alternatives to the methods and form of the proposed development can be discussed with the proponent, and a "best case" configuration decided on before submitting the EIS. In such a case, previous development configurations or methods could be discussed, and the reasons they were altered could be used to support the current configuration and methods of the development.

13.5.2.7 Assessing Potential Negative Impacts

Appendix C.1.1 provides examples of potential impacts associated with various development activities, as well as some possible mitigation techniques. Although the assessment of potential impacts should be quantitative, in some situations this will not be possible. Impacts may be short-term (e.g., siltation arising from construction) or long-term (e.g., loss of habitat). Impacts can also be classified as direct (e.g., woodland cutting/clearing) or indirect. Examples of indirect impacts include reduction in forest interior habitat due to fragmentation or loss of forest edge; the potential for increased access because of road creation; human disturbance; the introduction of predators such as cats; invasion by non-native species; and the effects of noise on wildlife. The Significant Wildlife Habitat Decision Support System (see appendix B.1.2) provides excellent descriptions of potential impacts on wildlife habitat.

A number of factors should be considered in assessing potential impacts, including:

- the spatial extent, magnitude, frequency and duration of the impacts;
- the extent and degree to which adjacent lands will be affected;
- potential impacts on specific features and functions; and
- whether the impacts are likely to result in cumulative impacts (for information on the assessment of cumulative impacts, refer to Bedford and Preston, 1988; Davies, 1991; Cocklin et al., 1992; and Leibowitz et al., 1992).

13.5.2.8 Identifying Mitigation Measures and Residual Impacts

While avoidance of impacts is preferred, mitigation involving implementation measures to prevent or reduce undesirable impacts may be used, provided that they are consistent with the PPS. The identification and implementation of mitigation measures are the responsibility of the proponent. Satisfactory implementation of mitigation measures can be enforced, for example, through conditions of approval for plans of subdivisions. The proponent should demonstrate that the mitigation measures it has identified will ensure that no negative impacts will occur on the natural features or on the ecological functions for which the area is identified.

Appendix C.1.1 provides some examples of potential development impacts and some possible mitigation measures. The Significant Wildlife Habitat Decision Support System provides mitigation measures for significant wildlife habitat (see appendix B.1.2). The decision support system may also provide measures applicable to some endangered species and threatened species for which more explicit guidance is lacking.

Whenever a project may have negative impacts on fish habitat (i.e., may result in an alteration of habitat), the proponent must consult DFO or the delegated authority concerning habitat protection. DFO or the delegated authority will advise as to whether the project is likely to harm fish habitat and, if so, what measures could be taken to avoid or reduce the damage so as to comply with the federal Fisheries Act.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

In some cases, protecting fish habitat may not be possible. In such cases, DFO may authorize the HADD of fish habitat under Section 35 (2) of the Fisheries Act. Authorizations are conditional, that is, DFO requires that acceptable compensation be provided (e.g., replacement of damaged habitat) to ensure that there is no net loss of habitat as a result of the project.

Residual impacts (i.e., those impacts that would remain after mitigation measures have been implemented), if any, must be identified. It is recommended that the assessment of residual impacts consider whether the potential exists for cumulative impacts resulting from the development.

13.5.2.9 Identifying Whether Residual Impacts Are "Negative Impacts" as Defined by the PPS

Impacts should be mitigated to the extent possible, as noted in the section above. Land use changes, however, will almost always result in some impacts that cannot be mitigated. While this does not necessarily mean that the proposed undertaking should be denied, the significant natural heritage features and areas the PPS identifies must be protected from negative impacts. The EIS should clearly identify residual impacts and include discussion of their significance, severity and longevity. The impact assessment should conclude with a statement indicating whether the proposed development will have any negative impacts on the natural heritage features or on the ecological functions for which an area is identified, thus enabling planning authorities to weigh the positive and negative aspects of a proposal and make an informed planning decision.

Appendix C.2.2 provides a sample review list for these assessments.

13.5.3 Identifying Monitoring Needs

The impact assessment may identify monitoring needs that may be considered as part of the planning authority's decision (see section 13.5.6). Monitoring is of two main types: compliance monitoring and effectiveness monitoring. Development of a monitoring program should begin with a clear set of goals and objectives against which to measure the monitoring results, and should specify a repository for the information. Also important is a contingency plan in the event that the results indicate that there are negative impacts on the features being monitored.

In some instances, a relatively rigorous level of monitoring may be required to test the effectiveness of mitigation or to properly assess baseline conditions as part of the evaluation of a feature. The type and magnitude of change that is to be detected should be taken into consideration when determining appropriate measures for such monitoring. If quantitative measures are required, the number of samples and frequency of sampling should be determined according to the inherent error of the observation method, the background variation in the process being measured and the magnitude of change that the measurer wishes to detect.

Planning authorities should undertake compliance monitoring to ensure that the proponent has implemented all mitigation measures identified in the impact assessment and that the measures are performing as predicted. Monitoring may be undertaken before, during and after construction. Periodic updates in aerial photography, especially if available in digital format, provide a "desktop" basis for updating quantitative measurements of the size and configuration of features within a monitoring area. Aerial photography can also be interpreted to indicate areas of natural succession and other natural disturbances, such as beaver activity within the monitoring area, as well as degradation.

Monitoring programs may be established for the completion of certain structural works in accordance with accepted standards as a condition of approval, where the power for applying conditions is established under the Planning Act (e.g., site plan controls – see section 12.5.1). This provides planning authorities with an opportunity to review monitoring results before proceeding with subsequent phases of a development, in accordance with appropriate conditions of approval. Where ongoing monitoring is required once the development is complete, approvals through an established Development Permit System (see section 12.5.2) can be used to measure the long-term adequacy of the mitigation measures.

The purpose of effectiveness monitoring is to determine the adequacy of the mitigation measures identified in the impact assessment, relative to avoiding negative impacts. Such monitoring may be appropriate where there is uncertainty as to the effectiveness of established mitigation measures to avoid negative impacts. Mitigation measures required to achieve no negative impact should generally be well established as being effective.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Although pilot projects may be necessary from time to time, unsuccessful attempts at mitigation may result in incremental losses of significant features.

Effectiveness monitoring requires that baseline data be collected before development occurs using methods that can be replicated later. For example, methods for monitoring vegetation or wildlife should be based on published and widely accepted monitoring methods, which are most likely to be statistically robust. In some cases, long-term monitoring programs may be required, particularly for impacts on surface- or groundwater quality or quantity. Remedial steps are undertaken where the results of monitoring indicate that actual impacts are greater than predicted impacts.

13.5.4 Approaches to Mitigation

PPS policies 2.1.4 and 2.1.6 require a demonstration of no negative impact on the natural features and areas described in policies 2.1.3, 2.1.4 and 2.1.5. To prevent negative impacts, mitigation will often be necessary; guidance for mitigation is provided below. Specific examples of impacts associated with various development activities and considerations for mitigation are provided in appendix C.1.1.

13.5.4.1 Mitigation through Design of Land Uses

The first step toward avoiding negative impacts is to develop designs that have the least potential for affecting natural features. Design should also account for many other planning considerations, for example:

- minimizing distances to employment and shopping;
- providing densities supportive of public transit; and
- adhering to local road standards.

It is recognized that minimizing environmental impacts is just one consideration of design. Policies 2.1.4 and 2.1.6 of the PPS are clear, however, in their requirement of no negative impacts on natural features. Planning authorities must make minimizing environmental impacts a high priority in the design process for proposed developments adjacent to natural features to be consistent with the PPS.

13.5.4.2 Buffers

The physical separation of development from natural feature boundaries using vegetated protection areas or vegetation protection zones is one of the most widely used mechanisms for softening or reducing (i.e., buffering) the impacts of land use changes on adjacent natural features. The lands to be set aside from development and kept in a vegetated state are commonly referred to as "buffers."

Buffers can contribute substantially to the protection of wetlands, woodlands, valleylands and other natural features. Appropriate widths for buffers vary depending on the sensitivity and functions of the features and proposed adjacent land uses (see section 16 and appendix C.1.2). The PPS identifies significant features that should be protected, but it does not specifically require or address the delineation or protection of buffers. Notwithstanding this, it has become standard practice of many planning agencies to require buffers adjacent to certain features (see section 4.5).

To be consistent with policy 2.1.6 of the PPS, an evaluation of the ecological function of adjacent lands is required if development and site alteration are proposed on them. Appropriate demonstration of no negative impacts on natural features or on their ecological functions could include the delineation of buffers that should be established and retained. Buffers must be determined and rationalized on the basis of their ability to protect natural features and their associated functions. As the impacts of adjacent development become better understood and more research is conducted on the ecology of various features, buffer requirements may change; therefore, current literature must be consulted to review the impacts relevant to the feature under consideration.

The function and benefits of buffers vary with the feature and the proposed adjacent use, and include those outlined in table 13-1.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table 13-1: Function and Benefits of Buffers

BUFFER BENEFIT	FUNCTIONS
Reduction of encroachment	• Encroachment into natural features is a common impact associated with residential development. Buffers provide some area for minor encroachment without affecting actual features. Buffers, which may contain trails, are often public spaces; therefore the public may exert pressure to maintain the natural feature in good condition, further reducing the likelihood of encroachment from adjacent properties.
Reduction of light and noise	• The physical separation of development from a natural feature reduces the penetration of light and noise into the natural feature. This will be further reduced if the buffer supports dense vegetation.
Space for tree-fall	• Where development abuts natural features, residents have asked municipalities to remove or prune edge trees that may be hazardous (i.e., in danger of falling) in order to preserve fences, outbuildings, etc. located in rear yards. Buffers that are approximately equal to the height of the canopy provide an area for tree fall to occur, thus preserving natural edge functions and reducing maintenance costs for the managing agency.
Protection of root zones	• The extent of root systems is highly variable, even among trees of the same species, and varies according to soil moisture, wind stress, companion species, land use, etc. Large buffers (in the range of 30 m from the drip line) probably capture most root systems and enhance long-term tree health.
Enhancement of woodland interior	• Although buffers should not become part of the feature, they will, if vegetated with shrubs or trees, extend the functional edge of woodland, thus enhancing the development of interior conditions.
Allowance for hunting habits of cats and dogs	• Domestic pets, especially cats, have a significant impact on bird, small mammal and possibly amphibian populations. Cats' home ranges are not large (Kays and deWan, 2004), and buffers will provide some of the required area, reducing impacts on natural features.
Location for trails	• Buffers provide locations for trails, thus contributing to healthy communities.
Attenuation of runoff	• Vegetated buffers slow down surface runoff and absorb nutrients and chemicals used for lawn care, agriculture and road maintenance, thus reducing impacts on natural features. If runoff is not controlled, impacts can include soil erosion/sedimentation, destruction of vegetation, and flushing of nests or eggs of amphibians and waterfowl. This is particularly important to adjacent wetlands and aquatic features where nutrients can enrich the system and lead to an abundance of nuisance weeds and/or algae.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Buffers should not be treated as extensions of the natural feature; therefore, if a buffer is allowed to become wooded, the natural feature boundary should not be extended to include it. The buffer may serve a number of functions, some of which may require management that may not be appropriate in a natural feature (e.g., trail construction), and such management should be allowed to occur.

Where feasible, buffers should not be located on lots privately owned by individuals. Rather buffer should be included into the same ownership as the feature that it is to protect. When buffers are incorporated into individual lots, consistent management of buffers is not possible. In such cases, different landowners will treat the buffer in various ways, and planning authorities will have little ability to enforce any zoning or covenants intended to preserve buffer function.

Where possible, buffers should be determined as part of subwatershed studies or secondary plan studies to allow an early determination of lands that may be suitable for development. Buffers may be refined during detailed EIS studies, but it is important that the sensitivity of features be assessed at an early stage so that the opportunity for mitigation using buffers is available during the design of draft plans. In certain circumstances, the adjacent lands width will need to be expanded beyond the recommendations provided in the manual, and in some cases those expanded adjacent lands widths will require a buffer to cover the entire area (see section 4.5).

13.5.4.3 Wildlife Passages

Barriers to wildlife movement can have negative impacts (e.g., wildlife mortality on roads). Development designs should avoid intersecting with wildlife migration routes. Wherever possible, wildlife should be funnelled by means of low barrier fencing or vertical walls to wildlife passage culverts to prevent wildlife from getting onto roadways. Where impacts on larger wildlife are anticipated, overpasses provided for these species could be integrated into other mitigation approaches.

13.5.4.4 Water Balance

Natural features and areas such as wetlands and fish habitat that are highly dependent on natural water regimes can be particularly vulnerable to negative effects when adjacent lands are developed. It is important in such instances to develop a water balance for the natural feature to determine the source and volume of the water that sustains it, and ensure that this balance is maintained after construction of the development. This will require a determination of the relative contributions to wetlands of groundwater, surface runoff and direct precipitation. Typically, development results in lower groundwater levels, through such impacts as the conversion of pervious to impervious surfaces that disrupt infiltration of surfacewater into the ground. In such cases, impacts can be anticipated, and base-line monitoring is needed in order to calibrate the water balance model and compare post-development monitoring results for anticipated impacts.

There are examples of "twin pipe" storm systems, where one pipe is used to convey "clean" runoff from grassed areas and rooftops to wetlands, and the other pipe takes water from driveways and roads to conventional stormwater treatment facilities. Water can be discharged to wetlands through a boundary cell that is separated from the wetland by a low, porous berm that allows water to seep into the wetland along a longer portion of the boundary than a point discharge. If this approach is used, applicants should consult with planning agencies to determine the appropriate volume of water to be introduced to the wetland. As part of the consultation, a "design storm event" standard should be agreed on for estimating the contributions of surfacewater to the wetland pre-construction. The design storm event should be one that is most important from an ecological perspective. For example, small, frequent events may contribute no surface runoff if the water from them infiltrates or evaporates before reaching the wetland; very large storm events, although they provide lots of water, may occur too infrequently to be ecologically critical. Precipitation events with a return interval in the two- to five-year range may be most important and should be used for design purposes, but this should be confirmed with the relevant plan review agency, as exceptions are probable.

13.5.4.5 Lighting

Lighting, especially high-powered lighting associated with security lighting and sports fields, may negatively affect wildlife. Options that direct lighting away from natural features toward the ground and that are designed to minimize light scatter could be used to mitigate this impact and protect dark sky values.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

13.5.4.6 Fencing

In some urban environments, fencing may be an effective mitigation tool for controlling public access. At least one Ontario municipality has a policy to fence all natural features in its jurisdiction. Fencing helps prevent access to natural features in locations where access is undesirable (e.g., where access leads to the development of ad hoc trails), funnels people to points of access planned as part of trails and recreational and educational programs, and restricts access from rear yards, thus reducing encroachment activities (e.g., dumping of grass clippings and yard waste, cutting of firewood, location of garden plots and accessory buildings). Fences without gates should be erected along property lines adjacent to natural features. Some municipalities have stipulated the use of "living fences," which essentially are hedges along property lines; however, these are ineffective at restricting access to natural features. Municipalities should also ensure that the design and location of fencing will not limit unintentionally certain ecological functions associated with natural heritage systems (e.g., movement of wildlife).

13.5.4.7 Public Education

Public education, especially of landowners whose property is near natural features, about the value of natural amenities and how some seemingly harmless everyday practices can lead to negative impacts (e.g., dumping garden waste in natural features can result in the establishment of invasive non-native plants), is helpful in reducing such impacts. As part of public education, an environmental features handbook and/or a site-specific pamphlet can be distributed to homeowners in development areas containing or adjacent to natural features.

13.5.5 Review of Assessment

The proponent submits an impact assessment to the planning authority. The planning authority reviews the assessment to determine whether it is acceptable in terms of the completeness of the inventory and description of features, the thoroughness of the evaluation of potential negative impacts, the adequacy of the mitigation measures and monitoring programs identified, and so on. In cases in which an approval authority does not have the capacity or expertise to review the EIS, the authority may commission a qualified professional to carry out a peer review.

The approval authority may request that further information be provided or alternative mitigation and monitoring measures be considered. MNR and other agencies may be consulted regarding technical aspects. Public input and review of the document may also be integrated into the process. For example, if a planning authority has an environmental advisory committee or similar group, it may be involved in the review of the assessment of impacts.

Using the sample review list provided in appendix C.2.2 can help a planning authority determine whether all issues have been adequately addressed in the impact assessment. The planning authority should review the impact assessment for completeness and technical accuracy.

13.5.6 Planning Authority Decision

In making its decision about a proposed development, the planning authority would consider the results of the assessment review, along with other relevant PPS policy (see section 2.3). The planning authority's decision can be contingent on the revision of the development proposal and/or the attachment of conditions. For example, approval may be contingent on the implementation of specific mitigation and/or monitoring measures. Alternatively, approval may be granted only after extensive revisions of the proposal.

As part of the decision-making process, a planning authority may:

- approve the development application;
- require revision of the proposed development to avoid impacts that the planning authority deems unacceptable;
- impose conditions of approval, where empowered under the Planning Act, to address certain already identified issues in more detail or to address new issues raised during the assessment process; or
- refuse the application.

In situations in which mitigation measures cannot prevent negative impacts on the natural features or on the ecological functions for which the area is identified, an application should be refused.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

14.0 PERFORMANCE INDICATORS

> The Province, in consultation with municipalities, other public bodies and stakeholders, shall identify performance indicators for measuring the effectiveness of some or all of the policies. The Province shall monitor their implementation, including reviewing performance indicators concurrent with any review of this Provincial Policy Statement.
>
> **Provincial Policy Statement 2005, policy 4.10**

> Municipalities are encouraged to establish performance indicators to monitor the implementation of the policies in their official plans.
>
> **Provincial Policy Statement 2005, policy 4.11**

n their simplest form, performance indicators may be considered with espect to particular features and areas identified in planning documents. Performance indicators may measure the degree to which policies and schedules in planning documents identify and evaluate natural heritage features and areas, and the extent to which the planning authority has implemented methods to assess the possible negative impacts of development on these natural heritage features nd areas.

Specific performance indicators may include:

- establishing baseline data on the total extent of woodlands, wetlands and other naturally vegetated areas in a planning area;
- the percentage of these features that is identified for protection or restoration in planning documents; and
- the change (loss or gain) in area of these features and how it is attributable to decisions over a specific period.

Planning authorities may wish to implement other more specific performance indicators where resources or situations permit. For example, techniques such as remote sensing, cumulative impact assessment or GIS analysis may be used to measure the changes. Other specific natural heritage features, such as significant habitat of threatened and endangered species and significant wildlife habitats, may be the subject of particular local performance indicators for the extent and number of such species and the extent of habitat.

In developing municipal performance indicators, planning authorities are encouraged to work closely with the local MNR district and conservation authority. They usually have information and expertise that will be useful in describing and monitoring performance indicators. Planning authorities may work with these agencies to develop common data collection and monitoring standards so that information can be most effectively shared and compared.

Several publications have been prepared on identifying and implementing effective performance indicators some of which are listed in the additional reading section.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

15.0 PROVINCIAL LAND USE PLANNING DOCUMENTS

The following list highlights relevant provincial land use planning documents that contain policy, implementation direction or other supporting guidance referenced in the manual that may be needed for applying PPS natural heritage policies. The list of supporting documents is not intended to be exhaustive. Supplementary documents (e.g., other provincial ministry guidelines) may have to be consulted when applying additional PPS policies beyond those for natural heritage (see section 2.3).

Questions on the use of provincial land use documents not developed by MNR should be addressed to MMAH or the appropriate lead ministry.

Where possible, a direct hyperlink is provided to the document, and efforts will be made to keep this information current. Users of this manual should access the most current version of the manual from MNR's Municipal Planning in Ontario webpages (see appendix B.1.2) to view the most current list of documents. This list, which is in alphabetical order, is current as of March 31, 2010.

Adaptive Management of Stream Corridors in Ontario including Natural Hazards Technical Guides
http://www.iwsstore.ca/publication_5.asp

- See appendix B.1.2 for more information on use of these resources for specific identification and evaluation of natural heritage features and areas.

Central Pickering Development Plan
http://www.mah.gov.on.ca/Page329.aspx

Ecological Land Classification Primer
http://www.mnr.gov.on.ca/en/Business/LUEPS/Publication/264779.html

Fish Habitat Referral Protocol for Ontario 2009
http://www.mnr.gov.on.ca/264110.pdf

Fish Habitat Referral Protocol – Agency Boundaries Map
http://www.mnr.gov.on.ca/264113.pdf

Greenbelt Plan
http://www.mah.gov.on.ca/Page189.aspx

Growth Plan for the Greater Golden Horseshoe
http://www.placestogrow.ca/index.php?option=com_content&task=view&id=9&Itemid=14

Inland Ontario Lakes Designated for Lake Trout Management (as amended and revised, May 2006)
http://www.mnr.gov.on.ca/256676.pdf

Lake Simcoe Protection Plan
http://www.ene.gov.on.ca/en/water/lakesimcoe/index.php

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Lakeshore Capacity Assessment Handbook: Protecting Water Quality in Inland Lakes on Ontario's Precambrian Shield (currently in draft)
http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTAwNjky&statusId=MTUwNDM1&language=en

Niagara Escarpment Plan
http://www.escarpment.org/landplanning/plan/index.php

Oak Ridges Moraine Conservation Plan
http://www.mah.gov.on.ca/Page1707.aspx

Ontario Wetland Evaluation System Manuals

Southern Ontario Wetland Evaluation System Manual:
http://publicdocs.mnr.gov.on.ca/View.asp?Document_ID=15728&Attachment_ID=33036

Northern Ontario Wetland Evaluation System Manual:
http://publicdocs.mnr.gov.on.ca/View.asp?Document_ID=15728&Attachment_ID=33037

Additional direction on the interpretation of existing OWES manuals:
http://publicdocs.mnr.gov.on.ca/View.asp?Document_ID=15728&Attachment_ID=33099

- See appendix B.1.2 for more information on the use of these manuals for specific identification and evaluation of natural heritage features and areas.

Ontario's Biodiversity Strategy
http://www.mnr.gov.on.ca/en/Business/Biodiversity/index.html

Parkway Belt West Plan
http://www.mah.gov.on.ca/Page5667.aspx

Provincial Policy Statement
http://www.mah.gov.on.ca/Page215.aspx

Significant Wildlife Habitat Technical Guide
http://www.mnr.gov.on.ca/en/Business/FW/Publication/MNR_E001285P.html

- See appendix B.1.2 for more information on the use of this guide for specific identification and evaluation of natural heritage features and areas.

Source Protection Plans when approved under the Clean Water Act
http://www.ene.gov.on.ca/en/water/cleanwater/index.php

Stormwater Management Planning and Design Manual
http://www.ene.gov.on.ca/envision/gp/4329eindex.htm

Understanding Natural Hazards
http://www.mnr.gov.on.ca/en/Business/Water/Publication/MNR_E002317P.html

- See appendix B.1.2 for more information on the use of this publication for specific identification and evaluation of natural heritage features and areas.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

16.0 ANNOTATED BIBLIOGRAPHY: ADJACENT LANDS AND BUFFERS RESEARCH

This bibliography is a compilation of research highlights and recommendations for the width and composition of adjacent lands and buffers, which serve to protect natural heritage features and areas.

Burke, Vincent J., and J. Whitfield Gibbons. (1995). Terrestrial buffer zones and wetland conservation: a case study of freshwater turtles in a Carolina bay. Conservation Biology 9(6):1365-1369.

Burke and Gibbons examined three freshwater turtle species to determine the terrestrial buffer zones required for them to complete their life cycles. The authors found that the habitat needs of freshwater turtles demonstrate that wetland biodiversity depends on the preservation of adequate amounts of upland habitats adjacent to wetlands.

The authors delineated, using GIS software, four buffer zones radiating from the studied wetland. None of the nests and hibernation burrows were inside the first boundary, the extent of the wetland itself, which is the boundary for wetland protection under federal wetland regulations. A 30.5 metre buffer zone (as adopted by some states) insulated only 44 per cent of nests and hibernation burrows. This is a clear indication that current federal and state wetland protection policies are inadequate for freshwater turtles. Burke and Gibbons also delineated biologically based buffers in this study and found that full protection of 100 per cent of the upland sites the three turtle species used would require a 275 metre upland buffer beyond the wetland edge, or a 73 metre buffer to protect 90 per cent of the sites.

The upland buffers that Burke and Gibbons recommend for maintaining ecological integrity are large, but they note that it may be feasible to allow limited, low-impact development in the distal portions of the buffers.

Carolinian Canada. (2000). Guidelines for determining setbacks and buffers. In Draft Guide for Determination of Setbacks and Buffers (pp. 27-33).

This chapter of the draft guide describes the purpose and components of development setbacks, and includes recommendations for their width and composition. The setback is described as including the geotechnical allowance (10 m), the ecological buffer zone (30 m) and an additional setback for rights-of-way (4 m). The ecological buffer zone appears to be calculated in addition to the geotechnical allowance, which provides protection from natural hazards.

The chapter provides recommendations for minimum buffer width and notes that they may need to be increased depending on potential effects of the adjacent land use:

- wildlife habitat: 100 metres
- woodlands: 10 metres beyond the drip line of trees (to protect the rooting zone)
- wetlands: 30 metres for water-quality benefits (3:1 ratio of upland to wetland habitat area for protection of small wetlands)
- watercourses: 30 metres from the high-water mark; 50 metres plus 0.5 metre per 1 per cent of slope for coldwater streams
- corridors: 100 metres (urban) and 200 metres (rural)

The chapter also discusses structures and activities that should be prohibited in the buffer. These include septic tanks, stormwater management facilities, holding tanks and impervious surfaces. It specifies that permitted uses in a buffer should be similar to those in the adjacent natural heritage feature. To facilitate administration and enforcement of the buffer, the buffer boundary should be outside the development zone, beyond rear lot lines.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Castelle, A.J., A.W. Johnson and C. Conolly. (1994). Wetland and stream buffer size requirements: a review. Journal of Environmental Quality 23:878-882.

Castelle et al. conducted a literature review of the scientific functions of buffers to determine effective buffer widths for protecting wetlands and streams. Specifically, they looked at the effectiveness of different buffer widths in removing sediments, nutrients and metals, as well as other buffer functions. The authors found that a range of buffer widths could be effective, depending on the desired function of the buffer and site-specific conditions. The authors identify four criteria that should be considered in determining an effective buffer width:

1. resource functional value
2. intensity of adjacent land use
3. buffer characteristics/condition (vegetation, soil disturbance)
4. specific buffer functions required

They also discuss results of previous studies (including examples of effective buffer widths for specific purposes and site-specific conditions) and group them according to buffer function:

- sediment removal and erosion control
- removal of excess nutrients and metals
- moderation of stormwater runoff
- moderation of water temperature
- maintenance of habitat diversity
- wildlife species distribution and diversity
- reduction of human impact

The authors concluded from the literature that buffer widths should be a minimum of 15 to 30 metres, because under most conditions narrower buffers provide little protection of aquatic resources. Buffers toward the lower end of this range may provide for the maintenance of the natural physical and chemical characteristics of aquatic resources, but greater widths are required for maintenance of biological components of wetlands and streams. The authors also note that variable-width buffers are better than fixed-width buffers at addressing site-specific conditions and desired functions but can be more costly to implement.

Chagrin River Watershed Partners, Inc. (2006). Why Riparian Setbacks? Willoughby, Ohio. http://www.crwp.org.

In this report, Chagrin River Watershed Partners Inc. provides a summary of research (including references) on riparian area functions and develops a model riparian setback regulation. The research summary includes the following highlights:

- The Chagrin River Watershed Partners Inc. model regulation recommends that riparian setbacks should range from 25 to 300 feet (applied from each side of the watercourse), depending on the watercourse drainage area.
- Minimum core habitat for amphibians and reptiles extends between 466 and 948 feet from the edge of riparian systems.
- Most degradation of the aquatic benthic community from sediment deposition is prevented by riparian setbacks 98 feet or greater.
- The National Academy of Sciences has described 100 foot setbacks as the default standard for watershed protection in the United States.
- A 150 foot riparian setback is necessary to protect water quality from sedimentation and pollutants. In developing this number, 34 pollutant-specific studies were reviewed. These studies showed an 82 foot setback is necessary to remove 80 per cent of sediments; a 197 foot setback is necessary to remove 80 per cent of suspended solids and nitrogen; and a 279 foot setback is necessary to remove 80 per cent of phosphorus.
- A 100-foot forested riparian setback from both sides of a perennial stream minimized the increase and fluctuation in river temperature following timber harvesting.

Environment Canada. (2004). How much habitat is enough: a framework for guiding habitat rehabilitation in Great Lakes areas of concern (2nd ed.). Canadian Wildlife Service. Pp. 80.

This federal guidance document specifies that streams should have a minimum naturally vegetated adjacent lands area 30 metres wide on both sides, or wider depending on site-specific conditions. In the rationale for this guideline, the report cites studies that provide an ecological basis for determining buffer widths and demonstrate the importance of taking species life history requirements into consideration.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The report references a review by Knutson and Naef (1997) in which riparian adjacent lands width recommendations were predominantly in the 23 to 60 metre range. These authors concluded that fish-bearing streams should have 46 to 61 metre buffers, depending on their classification, extending to 76 metres for streams identified as significant. The report references reviews by Castelle et al. (1994) and O'Laughlin and Belt (1995) that also indicate that effective buffer widths vary according to site-specific conditions and the desired function of the buffer. Wetland buffers are defined as "critical function zones" that provide a range of biophysical functions or attributes directly related to the wetland of interest. In its conclusion, the report also notes that there is increasing scientific support for the 30 metre guideline to be expanded to 50 metres and that it may be changed accordingly in the future.

Environmental Law Institute. (2003). Conservation Thresholds for Land Use Planners. Washington, D.C. Pp. 55.

The Environmental Law Institute's discussion of edge effects and riparian buffers contained in this report has strong relevance to the manual. The report defines "edge influence" as the distance from the periphery to the point where conditions (as indicated by specific criteria) do not differ from those in the interior habitat. Buffers are recommended to decrease the edge influence, by providing a transition between natural and developed environments. The report provides an overview of research on the distance that edge effects penetrate into ecosystems, including the following ranges: birds –16 to 700 metres, mammals – 45 to 900 metres, and microclimate changes – 8 to 240 metres. The majority of studies estimate edge influence to be 230 metres or less.

The report recommends that land use planners take a conservative approach and buffer remnant habitat patches by at least 300 metres from all edge peripheries, particularly for matrix and large patch community remnants (small patches may not require as wide a buffer). They note that the area within the buffer should not be counted as suitable habitat provided for species conservation. Roads, trails and other development should be at least 300 metres away from interior habitat to minimize their impact.

At the time of this report (2003), buffer regulations in the United States ranged from 6 to over 300 metres: 15 states and 7 local jurisdictions had adopted buffer regulations.

An interesting point that varies from recommendations in the majority of the literature is that variable-width buffers can be less efficient because they can retain less material than a uniform-width buffer of equivalent average width. The important thing to note is that variable-width buffers are better only if they conform to a minimum width and vary only by expanding beyond that minimum.

The summary of recommended buffer widths ranged from 1 to 1,600 metres, with 75 per cent of values extending up to 100 metres. The report indicates that at a minimum buffers should encompass the stream channel and the portion of the terrestrial landscape from the high-water mark toward the uplands where vegetation may be influenced by elevated water tables or flooding, and by the ability of soils to hold water.

On the basis of the majority of the findings, the report urges land use planners to plan for buffers as follows:

- a minimum of 25 metres for nutrient and pollutant removal
- a minimum of 30 metres for temperature and microclimate regulation, and sediment removal
- a minimum of 50 metres for detrital input and bank stabilization
- over 100 metres for wildlife habitat functions

Fischer, Richard A. (2000). Width of Riparian Zones for Birds. Ecosystem Management and Restoration Research Program Technical Notes Collection (EMRRP-SI-09), U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. http://el.erdc.usace.army.mil/elpubs/pdf/si09.pdf.

Fischer studied the appropriate width of riparian zones for birds in response to a lack of guidance available on buffer design, particularly for the purpose of preserving wildlife habitat. He cites several studies on the minimum widths necessary to sustain bird populations and found a range of recommendations (50 to 175 m), noting that narrow riparian zones may appear to have high diversity but the species present tend to be forest-edge species. Fischer concludes that riparian zones should be at least 100 metres wide (this applies to both sides for larger rivers and to total width for lower-order streams and rivers) if avian habitat is a management objective.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Fischer, Richard A., and J. Craig Fischenich. (2000). Design Recommendations for Riparian Corridors and Vegetated Buffer Strips. Ecosystem Management and Restoration Research Program Technical Notes Collection (EMRRP-SR-24), U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. http://el.erdc.usace.army.mil/elpubs/pdf/sr24.pdf.

Fischer and Fischenich present an overview of the recommended design specifications for riparian buffers and discuss the recommendations in relation to specific objectives. For example, if the objective is to protect water quality, the authors argue that priority locations for buffers within a watershed should be considered. Although all streams and rivers should have riparian buffers applied to each side, in some cases they are not feasible. Headwater streams have a greater influence on water quality within the watershed than downstream reaches and, to maximize the benefit, should be considered priorities for buffer placement.

The authors also note that long, contiguous riparian buffers are a higher priority in most cases than fragmented strips of greater width.

In terms of width recommendations, the authors note that variable-width buffers are better suited to meet their objectives than fixed-width buffers. Fixed-width buffers may be easier to enforce, but they often fail to meet their ecological objectives.

The authors present a summary table of buffer width guidelines according to function, which includes the following recommendations:

- water-quality protection: 5 to 30 metres
- riparian habitat: 30 to 500 or more metres
- stream stabilization: 10 to 20 metres
- flood attenuation: 20 to 150 metres
- detrital input: 3 to 10 metres

They conclude that buffers wider than 10 metres should be promoted, but note that widths of 100 metres or more are usually needed to ensure protection of values related to wildlife habitat.

Friesen, Lyle E., Paul F.J. Eagles and R.J. MacKay. (1995). Effects of residential development on forest-dwelling neotropical migrant songbirds. Conservation Biology 9(6):1408-1414.

Friesen et al. studied the effects of residential development on forest-dwelling neotropical migrant songbirds in 72 Ontario woodlots. Two variables were used: forest size and the number of houses outside a forest within 100 metres of the edge. The authors found a positive relationship between songbird abundance and forest size. They also found that development surrounding a forest severely undermined its suitability for neotropical migrants, and that avian diversity and abundance decreased as the level of adjacent development increased, regardless of forest size. Their data show that residential development within 100 metres of a woodland can degrade its quality as habitat for representative birds, such as wood thrush and rose-breasted grosbeak. In their discussion, the authors explain that fragmentation dynamics cannot be considered only within the context of habitat size. Adjacent land uses and external forces are key considerations for protecting functional habitats. On the basis of their findings, the authors conclude that threshold distances for housing developments around forests and woodlots need to be determined to prevent or minimize adverse effects on features and functions.

Grand River Conservation Authority. (2005). Environmental Impact Study Guidelines and Submission Standards for Wetlands.

The Grand River Conservation Authority, in consultation with the affected municipalities, will request an EIS for development (including new lot lines) within 120 metres of the boundary of a PSW or an unevaluated wetland.

Where a comprehensive plan is not available or lacks prescribed guidelines for determining buffers and setbacks, the Grand River Conservation Authority will request an EIS for development (including new lot lines) within 30 metres of a non-PSW, except where municipal policies require an EIS within a greater distance from the wetland boundary.

Based on current knowledge, the literature increasingly indicates that larger buffer requirements tend to be associated with the habitat requirements of wildlife, especially those species inhabiting marshes (Environment Canada, 2004). Therefore, minimum buffer widths based on water-quality parameters alone are unlikely to be sufficient for wildlife protection.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Houlahan, Jeff E., and C. Scott Findlay. (2004). Estimating the "critical" distance at which adjacent land-use degrades wetland water and sediment quality. Landscape Ecology 19:677-690.

Houlahan and Findlay studied the effects of adjacent land uses on wetland sediment and water quality and the spatial scales at which these effects occur. They undertook this study because there is a lack of research on the distance over which adjacent land use impacts extend. The authors point out that Canadian federal wetland policy acknowledges that wetland conservation must be pursued in the context of an integrated systems approach, but there are no recommendations for implementing such a philosophy.

The authors determined the critical distance of forest cover, road density and adjacent wetlands for removal of various nutrients (e.g., phosphorus, nitrates, potassium). In the discussion of their results, the authors argue that the widths of regulated buffers (30 to 120 m) are far narrower than necessary to protect wetland water quality. They note that for many types of sediment and nutrients the effects of adjacent land uses are detected at distances up to 4,000 metres and perhaps beyond. This implies that narrow buffers around individual wetlands will almost certainly be ineffective. The authors conclude that current U.S. and Canadian wetland conservation policy and regulations are highly unlikely to sustain wetland water and sediment quality. Instead, they advocate the maintenance of a heterogeneous regional landscape containing significant proportions of natural areas and maintaining comparatively large forested wetland buffers.

Houlahan, Jeff E., and C. Scott Findlay. (2003). The effects of adjacent land use on wetland amphibian species richness and community composition. Canadian Journal of Fisheries and Aquatic Sciences 60:1078-1094.

Houlahan and Findlay studied the effects of adjacent land use on wetland amphibian species richness, abundance and community composition in 74 Ontario wetlands. They found a clear tendency for amphibian species richness to decline as the intensity of adjacent land use increases.

Amphibian richness showed a positive relationship with forest cover on adjacent lands. Possible explanations include reliance on forests for non-breeding habitat and for movement between wetlands. Further, forest cover may be a measure of agricultural intensity in that adjacent lands that are forested do not contribute fertilizer and pesticide runoff as do lands used for agricultural purposes (rather, forested lands filter and trap runoff).

The study found that the size and quality of adjacent habitat are at least as important as (if not more important than) the size and quality of the breeding habitat. Incompatible adjacent land uses can affect amphibian species richness and community composition out to 3,000 to 4,000 metres from the wetland edge.

Having established that adjacent land uses affect amphibian species richness and community composition through a complex suite of effects (loss of habitat, diminished dispersal ability, declining water quality, and increased exposure to toxic substances), Houlahan and Findlay discuss the appropriate scale for managing adjacent land use. They acknowledge that buffers would be prohibitively large. Instead, the authors conclude that effective management of wetland amphibian communities will require managing "communities" of wetlands rather than individual wetlands, and land use planning measures to maintain critical threshold levels of forest cover, wetlands proportion, and road densities or traffic volumes at the regional scale.

Their research adds to evidence that regulation of a 120 metre band will not mitigate negative impacts on wetland ecological functions caused by incompatible adjacent land use and, in particular, by incompatible agricultural practices. Management of wetland amphibian communities must occur at the regional scale given that the habitat requirements of many species extend beyond the boundaries of an individual wetland.

Joyal, Lisa A., Mark McCollough and Malcolm L. Hunter Jr. (2001). Landscape ecology approaches to wetland species conservation: a case study of two turtle species in southern Maine. Conservation Biology 15(6):1755-1762.

Joyal et al. studied the habitat use and movements of spotted and Blanding's turtles in southern Maine to assess the importance of conserving multiple wetlands and the upland matrix in which they occur. The authors found that individuals of both species used multiple wetlands throughout the year and that both species used uplands extensively for nesting, dormancy and travelling between wetlands.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

They report that spotted turtles travelled 70 to 570 metres and Blanding's turtles 100 to 1,620 metres, and that upland nests of these two turtle species were up to 120 metres (in the case of spotted turtles) and 410 metres (in the case of Blanding's turtles) from the nearest wetland. The authors note that current wetland regulations that do not conserve the uplands surrounding a wetland fail to protect many wetland flora and fauna. Their three main conclusions are that small wetlands merit protection, that wetlands need to be conserved in groups or complexes, and that the terrestrial matrix surrounding wetlands needs to be protected.

North Carolina National Estuarine Research Reserve. (2002). Vegetated Buffers: Improving Environmental Quality in Coastal North Carolina. Technical Paper Series No. 5. http://www.nccoastaltraining.net/uploads/File/ctp/Vegetated%20Buffer%20-%20Technical%20Paper.pdf.

This technical paper explains that the effectiveness of a vegetated buffer in providing suitable wildlife habitat is a function of its width. However, in comparison to the buffer width required for removal of sediments, a significant amount of land must be set aside for a buffer to benefit wildlife. The paper provides the following table (adapted from Desbonnet et al., 1995), which summarizes buffer effectiveness based on width.

BUFFER WIDTH (metres)	POLLUTANT REMOVAL EFFECTIVENESS	WILDLIFE HABITAT VALUE
15	50% or greater sediment and pollutant removal	Poor habitat; good temporary wildlife activities
35	60% or greater sediment and pollutant removal	Minimally protects stream habitat; poor habitat; good temporary wildlife activities
50	70% or greater sediment and pollutant removal	Minimal general wildlife and avian habitat
65	70% or greater sediment and pollutant removal	Minimal general wildlife habitat; some value as avian habitat
100	70% or greater sediment and pollutant removal	May have use as a wildlife travel corridor and avian habitat
165	75% or greater sediment and pollutant removal	Minimal general wildlife and avian habitat
245	80% or greater sediment and pollutant removal	Fair to good general wildlife and avian habitat
330	80% or greater sediment and pollutant removal	Good general wildlife habitat; may protect significant wildlife
660	90% or greater sediment and pollutant removal	Excellent wildlife habitat; may support diverse community
2,000	99% or greater sediment and pollutant removal	Excellent wildlife habitat; supports diverse community; protects significant wildlife

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Odell, Eric A., David M. Theobald and Richard L. Knight. (2003). Incorporating ecology into land use planning: the songbirds' case for clustered development. Journal of the American Planning Association 69(1):72-82.

In this article, Odell et al. examine the zone of influence of a residential development for a songbird community in a mountain shrubland habitat. This study was conducted in response to growing "ranchette development," or rural sprawl, in the western United States that threatens to alter biological diversity. Two main factors in determining how development affects wildlife are the total area of habitat disturbed and the landscape fragmentation that inhibits wildlife movement (the zone of influence). In studying the abundance of human-tolerant and human-sensitive songbird species, the authors found that rural residential development has substantial effects on mountain shrubland habitat. Their data indicate that when a development borders undisturbed lands, a zone of up to 100 metres from a development should be considered affected habitat. In determining effective buffer widths, this information could indicate that a buffer of at least 100 metres should be applied to protect natural heritage areas (e.g., wetland, woodlots). The authors also strongly recommend that development be clustered to decrease fragmentation and perforation of habitat and to avoid critical habitat.

Odell, Eric A., and Richard L. Knight. (2001). Songbird and medium-sized mammal communities associated with exurban development in Pitkin County, Colorado. Conservation Biology 15(4):1143-1150.

In this study, Odell and Knight sought to determine whether a house-distance effect exists in terms of the response of wildlife species (songbirds and medium-sized mammals) to the proximity of residential developments. The authors examined wildlife populations within exurban developments of three different housing densities (high and low densities and undeveloped areas, including 20 sites within each of the three categories) to compare wildlife densities and composition along a development-density gradient. The frequencies of avian and mammal species were studied at 30 metres, 180 metres and 330 metres from developments.

The authors found that avian densities were altered up to 180 metres from developments and that vegetation cover was not significantly different at the three sampling distances, suggesting that avian density is influenced by other factors (e.g., edge effect, domesticated animals). Similar results were found for red fox and coyote, with greater frequency of animals at the farthest sampling sites (330 m). Coyotes were not found at all at 30 metres from developments. The authors conclude that the composition of native wildlife will be altered near exurban housing developments. When development borders undisturbed lands, a buffer of up to 180 metres around the development should be considered affected habitat. This study indicates that, in determining buffer widths, a 180 metre buffer should be considered for the protection of undisturbed habitat from new developments.

Semlitsch, Raymond D., and J. Russell Bodie. (2003). Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles. Conservation Biology 17(5):1219-1228.

Semlitsch and Bodie studied the size requirements for buffers around wetlands and riparian habitats for amphibians and reptiles. They defined core habitat as including the aquatic and terrestrial habitats needed to carry out life history functions.

The authors found that core terrestrial habitat ranged from 159 to 290 metres for amphibians and from 127 to 289 metres for reptiles, from the edge of the aquatic site. Their study also indicates the importance of terrestrial habitats for feeding, overwintering and nesting, and thus the biological interdependence between aquatic and terrestrial habitats that is essential for the persistence of populations. These results indicate that large areas of terrestrial habitat surrounding wetlands are critical for maintaining biodiversity.

Semlitsch and Bodie conclude that buffers of 15 to 30 metres, which are used to protect wetland species in many states, are inadequate for amphibians and reptiles. Further, the authors emphasize that the ranges given above for core terrestrial habitat are necessary habitat, not "buffers." Additional terrestrial habitat is needed to serve as a buffer for protecting core habitats and minimizing edge effects. In this regard, the authors propose a three-tiered approach to protection, which would include an aquatic buffer, the core terrestrial habitat zone (measured again from the aquatic edge, overlapping with the first zone), and a 50 metre terrestrial buffer at the outer edge. Given that the data show core terrestrial habitats of up to 290 metres, the total width of the three zones could be from 200 to 400 metres.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Sinclair, Kristen E., George R. Hess, Christopher E. Moorman and Jamie H. Mason. (2005). Mammalian nest predators respond to greenway width, landscape context and habitat structure. Landscape and Urban Planning 71:277-293.

This study explored the abundance of mammalian nest predators (e.g., racoons, cats) to greenway width, adjacent land uses and habitat structure. Forest corridor width and the development intensity of adjacent land uses were measured using aerial photographs. Among their findings, the authors report that the total abundance of mammalian nest predators was significantly higher in greenways with narrower forest corridors: "The abundance of mammalian nest predators was lowest in greenways wider than 200 metres and continued to decline as forest corridor width increased."

These findings suggest that if the reduction of avian nest predation is a management objective, wide buffers (greater than 200 m) around developments should be considered.

Theobald, David M., James R. Miller and N. Thompson Hobbs. (1997). Estimating the cumulative effects of development on wildlife habitat. Landscape and Urban Planning 39:25-36.

In this article, Theobald et al. explore the cumulative effects of development decisions on wildlife habitat. They discuss the response of wildlife to development as the "building effect" (similar to the edge effect concept) and the resultant disturbance zone. Of specific relevance to buffer width recommendations is the authors' discussion of a learned avoidance behaviour, or "flush" response (similar to the flight instinct), that some wildlife display. The authors reference findings that flushing distances can range from 15 to 300 metres for elk, 100 to 300 metres for mule deer, 15 to 45 metres for some waterbirds and 40 to 300 metres for grassland raptor species.

If buffer objectives include wildlife habitat protection, the appropriate flushing distances should be considered in determining effective buffer widths. The buffers or setback distances should be the minimum distance at which the species is unlikely to demonstrate avoidance behaviours. As an example, the authors report that one method to calculate the setback distances for colonial waterbirds uses the mean flushing distance, plus one-half the mean, plus 40 metres.

Wenger, Seth. (1999). A Review of the Scientific Literature on Riparian Buffer Width, Extent and Vegetation. Office of Public Service and Outreach, Institute of Ecology, University of Georgia.

Wenger conducted a literature review to provide a scientific foundation for riparian buffer ordinances that local governments in Georgia have established. He sought to determine the optimal width, extent (which streams are protected) and vegetation of riparian buffers.

Width

It is difficult to determine the effective buffer width for broadscale policy purposes because the width depends on the desired buffer function and the site characteristics. Wenger discusses factors that influence buffer width, including slope, rainfall, soil infiltration rate, soil moisture content, floodplain width, catchment size, land use, impervious surfaces and vegetation.

For sediment control, the literature indicates that 30 metre native forested riparian buffers should be preserved or restored along all streams (an absolute minimum of 9 m is given). For the greatest efficacy in removal of total suspended solids, buffer widths should be 60 metres. This width also provides protection from channel erosion.

To filter nutrients (e.g., phosphorus, nitrates) and other contaminants (e.g., pesticides, metals) from runoff, 30 metres is thought to provide effective control, with a minimum of 15 metres under some conditions. However, whether this width will be effective in removing nutrients depends on the land uses adjacent to the buffer that are responsible for the nutrient inputs (e.g., agricultural practices) and the direction of groundwater flow. Slope and vegetation of the buffer will also be key determinants of its effectiveness.

To maintain aquatic habitat (in terms of stream temperature control and inputs of large woody debris and other organic matter necessary for aquatic organisms), 10 to 30 metre riparian buffers of native forest should be preserved or restored along all streams. Protecting diverse terrestrial riparian wildlife communities requires some buffers of at least 100 metres.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Extent

Although universal protection of all streams and rivers (including perennial, intermittent and ephemeral ones, regardless of size) may not always be feasible, buffer regulations should be written to protect as many streams as possible. Seth provides a practical goal: protect all perennial streams and all intermittent streams of the second order or higher.

Vegetation

Buffers consisting of a combination of native forest and grass vegetation are recommended in the literature, as each type of cover provides distinct advantages to the purpose of the buffer (e.g., terrestrial riparian habitat, dissipating energy of surface runoff, filtration of sediment, root structure to prevent erosion).

Key recommendations from studies referenced in Wenger 1999 are provided below.

Birds

Keller et al. (1993) reported that the total number of neotropical migrant species increased with forest width, and 10 species increased in abundance as width increased. The authors recommended preserving riparian corridors at least 100 metres wide, and even wider corridors when possible.

Spackman and Hughes (1995) reported that 90 per cent of bird species are included within 150 to 175 metre buffers along most streams in surveys in Vermont forests. The findings relate to intact mature forests and are not completely relevant to riparian buffers bounded by open fields or urban development.

Hodges and Krementz (1996) reported that forest corridors of about 100 metres should be sufficient to maintain functional assemblages of the six most common species of breeding neotropical migratory birds.

Smith and Schaefer (1992) found small differences between bird populations in narrow (20–60 m) and wide (75–150 m) naturally vegetated buffers in an urbanized north Florida watershed.

Kinley and Newhouse (1997) studied breeding bird populations in riparian buffers of 14 metres, 37 metres and 70 metres in British Columbia. They found that densities of all birds increased as buffer width increased, and they concluded that narrower riparian buffers are of less value than wider buffers.

Mammals

Cross (1985) reported that diversity and species composition in a 67 metre wide riparian buffer bordered by a clearcut were found to be comparable to undisturbed sites in mixed conifer forest sites in southwest Oregon.

Reptiles and Amphibians

Gomez and Anthony (1996) reported that reptiles and amphibians that are dependent on riparian areas may require buffers of 75 to 100 metres and that many also require protection of large areas of old-growth and upland habitat

Burke and Gibbons (1995) found that a 275 metre upland buffer is required to protect all nest and hibernation sites for certain freshwater turtles in a Carolina bay.

Burbrink et al. (1998) found that 100 metre naturally vegetated riparian zones supported reptile and amphibian diversities that were similar to diversities found in 1 kilometre wide naturally vegetated riparian zones.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

APPENDIX A: NATURAL HERITAGE SYSTEM PLANNING

A.1 Natural Heritage Systems Planning Evolution

The concept of natural heritage systems is not new. The idea grew partially out of a European tradition of countryside conservation that generally treated the protection of natural features at a landscape level, rather than focusing on the protection of discrete patches. In North America, systems-based approaches to natural heritage planning were not well known until the publication of Forman and Godron's Landscape Ecology (1986). It marked the beginning of a shift in environmental thinking that included consideration of the relationship among natural heritage features, including connections and linkages, and the nature of the intervening lands.

In 1991, MNR produced a discussion paper, "A Natural Heritage Framework" (MNR 1991). The paper presented a critique of the then current approaches to natural heritage protection and proposed a natural heritage framework as a basis for identifying, protecting and managing natural heritage. The paper also provided guidance on integrating a natural heritage system into official plan policies.

A report on the status of planning in Ontario subsequently recommended changes to the Planning Act, including the following:

> In decisions regarding development, every opportunity will be taken to: improve the quality of air, land, water, and biota; maintain and enhance biodiversity compatible with indigenous natural systems; and protect, restore and establish natural links and corridors. (Commission on Planning and Development Reform in Ontario, 1993, recommended policy #11, p. 30).

Soon after, the Ministry of Municipal Affairs (now MMAH) released the Comprehensive Set of Policy Statements (1994), which included a policy to "protect natural links and corridors" and encouraged their improvement and enhancement. These policies were the basis for the 1997 Provincial Policy Statement and the first edition of the Natural Heritage Reference Manual, which described "the natural heritage system approach."

A.2 Considering Ecological Importance and Promoting Ecological Integrity

The following expands on section 3.4.3 and is a discussion of some key ecological concepts that are commonly incorporated into various natural heritage area evaluation procedures. These concepts are based largely on Crins (1996), Decker et al. (1991), Noss and Cooperrider (1994), Phillips (1996), Primack (1993), Riley and Mohr (1994), Shafer (1990) and Smith and Theberge (1986).

A.2.1 Representation/Distribution

A fundamental step in natural heritage system planning is to consider the protection of the full range of natural features that occur in an area, including both rare and common features, thus contributing to the preservation of biodiversity at the species and community levels.

Species, communities and ecosystems that are well distributed across their native range are less susceptible to decline than those confined to small portions of their historic range.

At the provincial scale, representation is normally assessed at the ecodistrict level. "Representation" refers to the extent that the full range of species, ecological communities, landforms and other natural features is included in a system of protected, or conserved, areas. It forms the cornerstone of the identification and evaluation procedure for the province's ANSI program (see section 10). In parts of southern Ontario where ANSI assessment has been extensive, planning authorities can make a significant contribution to the protection of the full range of natural features and species that occur in an area by ensuring the protection of any significant ANSIs that have been identified.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Planning authorities may also use representation as a factor in identifying natural features at a regional, county or area municipality scale. For example, some environmentally significant or sensitive area programs have used representation as a criterion for identifying important natural areas. Using representation at a larger scale provides a means to identify biological diversity and landforms that represent the natural heritage of regions and municipalities, and thus serve to provide examples of the original landscape. Representative areas provide a logical foundation on which a planning area's natural heritage system can be designed.

A.2.2 Patch Attributes

A.2.2.1 General

Where large core areas do not exist, groupings of habitat patches or patches with the potential for renaturalization should be included to maintain ecological functions at a landscape level. Including a cluster of natural areas that span a range of habitats may support a greater diversity of ecological processes (see section A.2.3.6).

A.2.2.2 Size

The relationship between overall habitat availability across the landscape and the size and shape of individual patches is complex and is still a subject of ongoing investigation (see Friesen et al., 1999, 1999; Rosenberg et al., 1999; Trzcinski et al., 1999; Austen et al., 2001; Golet et al., 2001; Fahrig 2002; and Lindenmayer et al., 2002). Generally, large patches of natural area are more valuable than smaller patches. Several reasons for why a single large patch is generally better than several smaller patches of the same total area are discussed below.

Large patches tend to contribute more to biodiversity than smaller patches of similar habitat. This is because large areas tend to contain a broader diversity of features and habitats than smaller areas. Therefore large areas generally contribute more to the diversity of features in an ecoregion/ecodistrict than smaller areas and meet more of the habitat requirements of a greater number of species than smaller areas.

One of the reasons for large areas meeting more of the habitat requirements of a greater number of species is that large areas generally provide more habitat for so-called area-sensitive species, which breed only in larger habitat patches.

In addition, the breeding success of some species appears to be reduced at forest edges, and these species tend to be found in larger patches with moist, protected "interior" (i.e., contiguous, relatively undisturbed, unfragmented) habitat rather than in smaller areas, which are strongly influenced by edge effects. Interior habitat is critical to the survival of many organisms (including such diverse groups as certain butterflies, amphibians, plants, and birds), which are often referred to as "forest-interior" species.

Another important reason that larger areas contain a broader spectrum of biodiversity is that, compared with small natural areas, large natural areas are more likely to have intact internal ecosystem functions (e.g., nutrient cycles and food webs) and conditions that permit different successional stages to co-exist. For example, interior microclimate conditions are more likely to allow the persistence of specific habitat functions that meet breeding requirements for a greater number of species. Such elements include vernal woodland pools, shaded rock outcrops and fissures, dead trees and rotting logs.

Large natural areas are generally more resilient than smaller ones to the impacts of human disturbance. For example, many of the smaller woodlots in southern Ontario contain a large number of invasive exotic plant species that have displaced native species. Large areas are also capable of supporting larger populations of different species that tend to be more resilient to human-induced and other disturbances than are smaller populations contained in smaller blocks of similar habitat (Noss and Cooperrider 1994).

Notwithstanding the importance of large intact patches, small areas, cumulatively, can provide significant benefits to the overall landscape and potentially act as critical habitats. The overall amount and type of smaller habitat patches in the landscape should be considered as part of natural heritage system development and may be more important than the size of individual patches, depending on location (Environment Canada, 2004). Many small natural areas are worthy of protection. Such areas may be important for several reasons, which are highlighted below.

Small areas can support rare plant or animal species found nowhere else in the area, especially if they provide unique habitat conditions. Such small areas may be particularly important to species with low mobility (Riley and Mohr, 1994).

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Small areas, particularly if interspersed among larger habitat patches, can provide important temporary refuges, better enabling more mobile species to move between larger patches. In highly diverse landscapes, several smaller protected habitat patches may provide better representation of a wider range of habitats than does a single larger protected habitat patch (Peterson and Peterson 1991, cited in Riley and Mohr 1994).

A.2.2.3 Shape

The shape of natural heritage areas affects their value as wildlife habitat and their resilience to disturbance effects. Round or block-shaped patches contain less "edge" per unit of area than long, narrow patches. "Edge" refers to the area where different habitats (or habitat conditions) meet. For example, edges occur where woodlands meet open fields, where uplands meet lowlands, along shorelines and fencerows, and at the interface between deep water and shallow water.

Many species of wildlife (e.g., deer, song sparrows) need edge habitats. Other species, however, require large contiguous blocks of habitat well away from habitat edges. These areas are often termed "interior" habitats. Woodland edge is often defined as extending 100 metres rom the outermost trees (Environment Canada, 2004; Toronto and Region Conservation Authority, 2004); however, edge effects vary depending on forest type, position in the landscape and other factors. Some biological impacts, such as cowbird parasitism and predation by ays, raccoons, skunks, foxes, and so on, may extend hundreds of metres into woodlands (see Groom et al., 2005). With respect to biological effects, 100 metres is probably a conservative estimate of the extent of edge effects. Where natural features are close to human habitation, sociological edge effects also occur. Matlack (1993) eported human impacts up to 70 metres from woodland edges.

n parts of Ontario, particularly in the south, the fragmentation of atural habitats, especially woodland, has created an abundance of dge habitat but has simultaneously reduced the number of woodlands, number of habitats providing interior habitat, and the area f interior habitat. Consequently, in southern Ontario, round or lock-shaped areas would normally be higher priority areas for rotection than long, narrow habitats of similar composition. In some tuations, however, narrow habitat patches may have special value in nsuring the connection among other natural heritage features.

A.2.2.4 Proximity/Connectedness

Blocks of habitat that are arranged close together are usually better than blocks of habitat that are located further apart. There are two reasons for this. First, wildlife is able to move more safely between closely spaced habitat patches than between patches located farther apart. Second, closely spaced patches are more likely to have important functional (i.e., hydrological or biochemical) linkages than patches spaced farther apart. The Upper Thames River Conservation Authority (2003) found a significant negative correlation between native plant species richness and distance between natural features and ANSIs. Thus the shorter the distance between a woodland and an ANSI, the greater the species richness.

As indicated above, smaller natural areas generally meet the needs of fewer species of wildlife and support smaller populations of species than larger areas. The remaining natural features in the existing landscape may simply be too small to meet the habitat needs of many species that once used the area, and smaller areas, on average, will contain a lower diversity of habitat conditions than larger areas. Small areas are also more easily damaged by disturbances and are less likely to have their functional processes intact. However, connections between small and large habitats can be important.

Another potentially serious consequence of habitat fragmentation is the physical separation, or isolation, of one habitat patch from another. If separation distances are large enough, the movement of plants (i.e., their seeds) and animals from one patch to another can be hindered or prevented. The resultant isolation of one wildlife population from another can:

- prevent, or make difficult or more dangerous, movement among areas used for feeding and/or shelter or resting areas;
- disrupt seasonal movements needed to complete life cycles of some wildlife (e.g., amphibians, which overwinter in woodlands but migrate to ponds in the spring to breed);
- prevent dispersal of juveniles to other habitats in the area where better habitat conditions may exist;
- lead to inbreeding that, over time, may reduce the ability of the population to adapt to changing environments; and
- prevent the recolonization of an area after local extinctions.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

As a general rule, then, interconnected patches of habitat are better than isolated patches. However, there are exceptions. Some of the habitats and species found in some isolated areas are better protected when they are isolated from other areas. Other habitats (and species) do benefit from connections, but only if the connections between them have the appropriate characteristics. For example, very narrow connections, such as fencerows that link one woodlot to another, can expose prey species to higher predation rates that may reduce their overall population. The key is to plan for connections of larger woodlots or a network of smaller areas. In doing so, the widest possible connections can be protected. Where connections are very narrow, planning authorities may consider widening them. Connections must be designed to be "ecologically functional," that is they must serve to function for the species, or groups of species, that may use them, and not simply be open space linkages.

A.2.3 Linkage/Corridor Attributes

A.2.3.1 General

Bennett et al. (1994) document three attributes of connections that will affect their use: habitat, width and connectivity. These three aspects of connections are difficult to separate from one another, as well as from the effects of behaviour.

The ecological function that a linkage performs will depend on the nature of the linkage. Factors that may affect the ecological function of a linkage include its length and width (generally, a wider linkage is better than a narrow one and width should increase relative to length), composition, orientation and configuration. The significance and relative importance of these factors vary with the needs of different species. Some linkages may serve to connect habitat that particular species need to complete their life cycles (e.g., linkages between wetlands and upland areas that allow reptiles and amphibians to move between breeding and summer/winter habitat).

Consideration of width may have to take into account that some species, such as many woodland plants, are unable to travel the entire length of the corridor in one life cycle. The corridor needs to capable of sustaining the species. Ideally, planners would obtain a complete list of species that might be expected to use the linkage and ensure that their movement requirements will be met. However, complete species lists may be unavailable for a particular landscape, and information about species mobility in different landscape structures (e.g., percentage cover, fragmentation) is lacking. Generally, then, a precautionary approach should be taken, whereby linkages are identified and designed to meet the known movement requirements of the more demanding species (e.g., species prone to predation or averse to openings, or species that move very slowly).

Geographic scale is a strong consideration in the identification of linkages. Linkages that are designed to function at the landscape scale may be greater in width (several hundred metres or more) and more generalized relative to connections at the local or site scale. Examples of these differences in scale are found in the provincial land use plan natural heritage systems developed for the Oak Ridges Moraine and Central Pickering (see section 15 to access an electronic copy). The Oak Ridges Moraine natural heritage system is at a larger scale and generally contains 2-kilometre wide linkages while the Central Pickering Development Plan corridors are at a smaller scale, a minimum of 100 metres wide.

Having more than a single linkage in a system is desirable. Such redundancy should be considered as a precautionary approach that enables the system to retain overall connectedness if a linkage is interrupted by future activities or natural events. In this way, alternative or multiple linkages in the system can assist in maintaining ecological functions, as well as the overall ecological integrity of a natural heritage system.

It may be impossible to find unbroken natural corridors to provide all the linkages required in a natural heritage system. In such situations, smaller patches of natural cover that are closely spaced can serve as stepping stones for species movement, and thus be identified as a linkage. These stepping stone patches of natural cover can provide temporary refuges for mobile species, facilitating their ability and willingness to move across the landscape.

When identifying linkages, their ecological appropriateness should be considered. They should be assessed in terms of whether a natural relationship exists between the core areas or features being connected. These considerations are particularly important when identifying linkages that should be restored or established in fragmented landscapes, especially when installing wildlife passages as part of an infrastructure project.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

While the general intent of PPS policy is based on the scientifically supported premise that a connected landscape is ideal, in some unusual situations a specific linkage might actually diminish the ecological value of an area (e.g., by introducing unwanted species or by drawing out species that existed in a previously unconnected and relatively undisturbed area). Scientific research and practice, however, continue to demonstrate that maintaining terrestrial linkages and connectivity between natural habitats ensures better ecosystem functioning than having a number of isolated natural areas (e.g., Naiman et al., 1993; Forman, 1995a, 1995b; Fleury and Brown, 1997; Beier and Noss, 1998).

Other aspects of sustainability of the path for the linkage can be considered. They may include factors related to opportunities for species success, such as whether the linkage runs parallel with compatible land uses (e.g., non-cultivated areas of agriculture), whether an area of comparable habitat is within the system to serve as a destination, and whether the linkage contains physical barriers (e.g., major roads or urban areas) to movement of animals and plants.

The surrounding land uses (e.g., urban/developed or agricultural) and the need for the linkage to be naturally vegetated or not should also be taken into account, particularly when linkages are being identified at fine scales. The identification of linkages in agricultural areas would indicate an intention for both interests to be accommodated in the working landscape, for example, through good farming practices and stewardship, and not an intention to restrict existing agricultural uses through land use controls.

Opportunities for establishing linkages may be associated with valleylands, riparian areas, utility corridors and landforms such as escarpments, moraines, eskers and glacial meltwater channels. These may have relief, terrain, soil, drainage or other characteristics that discouraged intensive uses and provide linkages that are realistically possible.

There are several reasons to recognize and give priority to maintaining existing linkages, as opposed to depending largely on future efforts to restore or establish connections. First, maintaining existing linkages alleviates concerns about the ecological appropriateness or path suitability of a linkage.

Second, some research (e.g., Bailey, 2007) has found that attempts to reverse fragmentation cause a delayed reaction – due to the continued effects of past fragmentation and the time it takes for new links to modify species distributions – and that even if a species is able to reach new habitat, a functional community may take some time to develop.

A growing body of literature provides linkage examples that should be studied for guidance on the design of functional corridors. General references that provide background information (e.g., Noss, 1993; Noss and Cooperrider, 1994; Bennett, 1999; Groom et al., 2005) should be consulted to understand the issues to be addressed and the approaches to be taken in resolving them. Relevant journals (e.g., Conservation Biology, Wetlands, Journal of Applied Ecology, Landscape Ecology and Journal of Biogeography) should also be reviewed to obtain recent research (e.g., Gibbons, 2003; Sinclair et al., 2005; Bowne et al., 2006).

A.2.3.2 Habitat

Planning for corridors should account for the habitat needs of the species that will be most frequently using them. Where possible, the corridor should incorporate the species habitat requirements for daily movement within their habitat range. This is especially true when an individual resides entirely within the corridor, as in the case of small mammals (e.g., mice, voles, shrews, chipmunks), some birds, and insects (Rosenberg et al., 1997; Tischendorf and Wissel, 1997). Conversely, if a corridor does not provide habitat for reproduction or hibernation, the corridor must be short enough that an individual can traverse it during one activity period[62] (Saunders and Hobbs 1991). Therefore, as the distance between natural areas increases, the need to provide appropriate habitat to support resident species increases.

A few studies show negative effects of corridors that create marginal habitat for certain species. For example, corridors can be marginal habitat for certain breeding birds if the edge-to-interior ratio of such corridors is low because of the increase in edge effects such as predation (Weldon, 2006). Planners should be aware of the species present in an area and how corridor design will affect them.

---

[62] An activity period is the length of time an animal is active, either during the day or night. This can be a few hours separated by periods of rest, or it can be for the length of an entire day or night.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The creation of marginal habitat does have value for species moving between local populations or seasonally (migration). This is termed "compensatory behaviour" by Rosenberg et al. (1997) and "conditional acceleration" by Tischendorf and Wissel (1997). Both groups of authors have theorized that individuals will move at a faster rate through a low-quality corridor and at a slower rate through a high-quality corridor. This assumes that the high-quality corridor provides the appropriate habitat requirements for an individual, which results in frequent cross-directional use and consequentially a slower movement rate. These authors also agree that evaluating which type of corridor is more conducive to successful movement along it is difficult.

A.2.3.3 Shape

As Tiebout and Anderson point out (1997), an important consideration for the shape of corridors is the dispersal patterns of the species that will be using them. These authors described two basic types of dispersal: directional and random. Directional dispersers can recognize and intentionally move to areas where the number of individuals of the same species is low, or recognize suitable sites from a distance. Random dispersers move in a random fashion across broad fronts of lateral contact. A corridor designed for random dispersers would require a larger portion of the corridor to be in contact with the core area, to increase the chance of individuals locating the corridor. Directional dispersers would require a corridor located in the direction in which they typically move.

From a functional perspective, corridors need to be designed to maximize the ability of animals to use them. Some animals will disperse along established routes and will learn to use the available routes (red fox, coyote, raccoon and white-tailed deer probably fall into this category). Other species, however, may disperse randomly (some researchers claim that frogs, especially newly emerged young, may not have any sense of direction and disperse randomly). To increase the probability that animals will locate corridors, it is proposed that they be designed with a funnel shape at either end, to maximize the "contact surface" between the core and the corridor. Farther away from the "contact surface," the corridor can narrow down to the recommended width.

A.2.3.4 Length

The distance an individual species travels and the length of time required to complete the journey depend to a large degree on the length of the corridor and, to a lesser extent, the type of habitat and width of the corridor. For example, white-footed mice can travel from 286 to 421 metres in one evening (Henein and Merriam, 1990). Deer mice typically travel up to 300 metres in dry forests and fields while foraging (Banfield, 1974). Leopard frogs foraging in upland habitat remain within a small area (home range), moving a minimum of 7 metres to a maximum of 53 metres; typical distances for this species are in the range of 5 to 10 metres. On rainy nights, longer movements of 100 metres or more in a single direction have been observed (Dole 1965). Whitford and Vinegar (1966) observed movement rates for spotted salamanders of 9 to 12 metres per hour along seepage areas and 6 metres per hour along open fields.

A designed corridor should provide appropriate habitat for the foraging requirements of the species, and in some cases for breeding or hibernating requirements as well. In the interspersed woodlands and agricultural lands that typify most of southern Ontario, corridors may have to be planned across agricultural fields, and habitat restored within them, where this is suitable to the landowner.

A.2.3.5 Width

Noss (1992) suggests that long corridors (more than 16 km) should be at least 1.6 kilometres wide and shorter corridors be at least three times the "edge effect." Habitat edges differ from habitat interiors in having a unique set of conditions that support flora and fauna. Edge effects are particularly relevant in forests where certain species require interior conditions and are intolerant of edge habitat. Meeting the corridor requirements for "interior species" may require that interior conditions are present within corridors. One hundred metres is typically used as a measure of the extent of edge effects in woodlands. Using Noss's criterion, this translates into 300 metre wide corridors.

Other authors have reported much larger edge effects: Janzen (1986) reported weedy edge species penetrating interior habitat up to 5 kilometres or more, and suggested, in accordance with Noss's criterion, a 15 kilometre wide corridor; Noss (1993) observed that forest interior bird species (e.g., hairy woodpecker, parula warbler) usually do not occur in hardwood corridors less than 50 metres in width.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Environment Canada et al. (1998) suggested corridor widths from 50 metres for generalist species (e.g., white-tailed deer, raccoon) and up to 500 metres in rural areas for species that require interior forest habitat.

There have been some studies on the appropriate width of corridors along watercourses. Spackman and Hughes (1995) determined that 150 to 175 metres of forest is required from the high-water mark of a watercourse to capture 90 per cent to 95 per cent of the bird species in an area. They also found that a 20 to 40 metre width from the high-water mark is necessary to capture 95 per cent of the plant species. Cronquist and Brooks (1993) determined that at least 125 metres of forested vegetation from the stream bank is required to contain all of the sensitive bird species in an area. The U.S. Forest Service (1993), as cited in Vora 1994) has suggested corridors 400 metres wide on either side of major rivers for watershed protection and biological migration. Environment Canada (2004) provides a good review of riparian corridors and notes that recommendations in the literature vary from a few metres to over 100 metres. Environment Canada recommends a minimum of 30 metres of naturally vegetated habitat on both sides of streams based on their literature review.

A.2.3.6 Habitat Diversity/Complexity

Natural areas (or clusters of areas) that span a range of topographic, soil and moisture conditions tend to contain a wider variety of plant species and plant communities, and may also support a greater diversity of ecological processes, than similar areas that occupy a narrower range of topographic, soil and moisture conditions. Areas with a high diversity of plant species and plant communities will generally support a correspondingly high diversity of animal species and communities. For example, a natural area that includes both wetland (lowland) and upland components will provide a greater range of habitat conditions for wildlife than either habitat type alone. Similarly, a wetland that contains each of the four wetland types (marsh, swamp, bog and fen) will provide more habitat diversity than a wetland composed entirely of marsh.

A.2.3.7 Species Diversity

Areas that contain a high diversity of plant and animal species are generally more important than areas that contain a lower diversity of species. These areas tend to provide benefits due to the existence in them of several different vegetation communities and numerous microhabitats. Disturbed sites often have less vegetative structure, frequently lack sensitive species and may contain non-native species that can reduce the diversity of native species. In some situations, however, areas that contain a relatively low diversity of plant and/or animal species are important, for example, those that provide habitat for an endangered or threatened species, or other species of particular interest such as interior woodland species or species that require large areas of habitat (e.g., area-sensitive species).

Species richness assessments can be undertaken as a means of comparing sites in terms of their species diversity. Species lists that MNR, conservation authorities and others compile in individual site inventory reports may be useful in conducting such assessments. It is suggested that diversity be assessed relative to each candidate area's size, since the number of species will vary with size.

A.2.3.8 Species Rarity

In general, habitats that contain rare species are more valuable than habitats that do not. "Rare" is a relative term and may describe:

- species that are scarce but occur over a wide geographical area;
- species that inhabit only one place;
- species that are geographically separated from their main range;
- species that are at the edge of their geographical range; and
- declining species that were once more abundant and/or widespread but are now depleted.

In assessments, rarity is often expressed as the number of rare species or features in an area. The occurrence of rare species may add to the significance of a particular feature or area. Species and communities can be considered rare at one or several scales (e.g., local, regional, provincial, national, global). The NHIC is the recognized authority for providing the status of species at the provincial scale. It also provides the status, where known, of species at the national and global scales. MNR and various other organizations (e.g., municipalities, conservation authorities, naturalist groups) may have developed local and/or regional species status references that could be used to determine species rarity (see additional reading section).

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

A.2.3.9 Naturalness and Disturbance

Relatively undisturbed natural areas are generally more desirable than highly altered areas and are valuable because they provide and promote biological diversity, habitat for native species, green corridors and space.

They also provide the best source of baseline information to compare with that about other modified areas. Studying how undisturbed ecosystems function increases understanding of how human impacts modify ecosystems. As well, undisturbed natural areas furnish important clues for restoring ecosystems that have been modified.

Methods used to evaluate naturalness vary depending on the ecosystem, the information available and the level of human disturbance. For example, the naturalness of a natural feature may be assessed by measuring the relative absence of exotic species, evidence of past disturbance such as cattle grazing, or human-made structures such as dams, roads or buildings. Wilhelm and Ladd (1988) developed a quantifiable approach to measuring the quality of natural features, called the "Floristic Quality Index" (FQI). This approach relies on evaluating the local flora and ranking each plant species on a scale from one to 10 with respect to its affinity to a limited range of habitat conditions. Species that persist only within a narrow range of habitat conditions are said to be "conservative" and are assigned a high value. Species that inhabit a wide range of habitats (i.e., are considered "weedy") are assigned low numbers. The NHIC has ranked the flora of southern Ontario to enable application of this method (Oldham et al., 1995).

A.2.3.10 Hydrological and Related Values

In many areas, waterbodies, including wetlands, often represent a relatively small percentage of the total land area, yet they can be disproportionately more valuable than other areas for several reasons:

- They contain a large number of aquatic or riparian (moist-area-dependent) plant and animal species that rely on water features or wetlands to fulfil their habitat needs.
- They contain a large number of animal species that require access to water features for all or part of their life cycle in order to survive.
- Because many water features are linear, they serve to connect other natural features and act as travel or migration corridors for many species.
- They are critical to the maintenance of nutrient and other biochemical nutrient cycling processes on which all species depend.
- They are integral to the hydrological functioning of the watershed within which they are located.

It is recommended that measures be taken to protect water features, wetlands and other areas of significant hydrological importance (e.g., headwaters, recharge areas, discharge areas) within natural heritage systems. In some cases, this will require protection of adjacent upland features as well, especially those where a combination of soil types promote groundwater flow in a localized direction where it feeds seeps and springs. In addition, the relationship between water features and vegetation is often interactive: the vegetation may contribute to the persistence of a water feature by shading it and protecting it from drying out, and the water feature may be responsible for the growth of the vegetation in an area. The disruption of either the vegetation or the water features could therefore have wide-ranging cumulative effects on the habitat.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

A.3 Checklist – Planning for a Natural Heritage System

This checklist provides planning authorities with a list of important considerations to assist them in identifying natural heritage systems. Planning authorities may augment the checklist or adapt it (e.g., determine that any of questions 1 to 7 are not relevant to site-specific planning) to address a range of planning circumstances. Planning circumstances can include requesting that natural heritage systems be identified on subject lands as part of a development application, assessing the work of proponents or planning for natural heritage systems themselves. It is important to stress that any decision to identify a natural heritage system shall be consistent with the PPS.

NATURAL HERITAGE SYSTEM CHECKLIST

QUESTIONS		YES	NO	COMMENTS
STAKEHOLDERS				
1. Have relevant stakeholders (adjacent municipalities, conservation authorities, development organizations, agricultural organizations, special interest groups, the public) been involved throughout the development of the natural heritage system (e.g., through a steering or liaison committee)?		☐	☐	
GOALS AND OBJECTIVES				
2. Have the goals and objectives been clearly articulated in the initial planning so that the final product is clearly defined and the results can be evaluated?		☐	☐	
3. Do all participating stakeholders have a clear understanding of the objectives of the natural heritage system?		☐	☐	
4. Do the participating stakeholders agree on the objectives so that the project can proceed?		☐	☐	
5. Do the goals and objectives include statements about natural heritage interests (which are interrelated), including:	a. maintaining, improving or restoring biodiversity?	☐	☐	
	b. maintaining, improving or restoring ecological functions?	☐	☐	
	c. protecting natural features and areas for the long term?	☐	☐	
	d. representing the full range of landforms and vegetation types in the natural heritage system?	☐	☐	
	e. recognizing linkages between and among natural heritage features and areas, surfacewater features and groundwater features?	☐	☐	

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Natural Heritage System Checklist *(continued from previous page)*

NATURAL HERITAGE SYSTEM CHECKLIST

QUESTIONS		YES	NO	COMMENTS
6. Do the goals and objectives include statements about other provincial interests reflected in the PPS, including:	a. public trails systems (subject to achieving environmental protection objectives and recognizing trespass issues and the possible need for an education strategy)?	☐	☐	
	b. protection of headwater sources and other water features and hydrological functions necessary for the ecological and hydrological integrity of the watershed?	☐	☐	
	c. protection of drinking-water sources?	☐	☐	
	d. access to mineral aggregate resources?	☐	☐	
	e. considerations for rehabilitation of mineral aggregate operations?	☐	☐	
	f. access to minerals and petroleum resources?	☐	☐	
	g. agricultural uses?	☐	☐	
	h. existing publicly accessible municipal parklands and open space areas (natural heritage components), provincial parks, conservation reserves and conservation areas?	☐	☐	
	i. sustaining healthy, liveable and safe communities?	☐	☐	
	j. efficient use of land and resources?	☐	☐	
	k. transportation and infrastructure corridors?	☐	☐	
	l. supporting energy efficiency and air quality?	☐	☐	
7. Do the goals and objectives include statements about other interests locally identified, including:	a. protecting local biodiversity?	☐	☐	
	b. preserving the natural environment for future generations?	☐	☐	
	c. incorporating the distinctive natural character of an area?	☐	☐	
	d. incorporating ecologically important landforms?	☐	☐	

(continued on next page)

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Natural Heritage System Checklist *(continued from previous page)*

NATURAL HERITAGE SYSTEM CHECKLIST			
QUESTIONS	**YES**	**NO**	**COMMENTS**
COMPLETENESS OF DATA			
8. Have all data sources been consulted and incorporated where relevant?	☐	☐	
9. Are there data gaps that should be filled before a natural heritage system is developed?	☐	☐	
10. Are all major natural features identified?	☐	☐	
11. Are all identified natural heritage features evaluated, as appropriate under the PPS (policies 2.1.3 and 2.1.4), with respect to significance?	☐	☐	
12. If all identified natural heritage features are not evaluated, as appropriate under the PPS, with respect to significance, is the project designed to support the identification of certain features, e.g., significant woodlands, as significant based on their ecological contribution to the natural heritage system and attributes identified through the natural heritage system process?	☐	☐	
ADEQUACY OF CORE AREAS OR "PATCHES" These ecological concepts may be represented by significant features such as woodlands, wetlands and wildlife habitat.			
13. Have larger woodlands been identified? (See section 7.3.)	☐	☐	
14. Are there areas that are large enough to support populations of area-sensitive species (e.g., interior forest and grassland bird species) in the long term? (See appendix A.2.)	☐	☐	
15. Are cores/patches of suitable shape (e.g., blocky/non-linear) to facilitate the protection and/or development of interior conditions (especially with respect to woodlands and wetlands)? (See appendix A.2.)	☐	☐	
16. Has the ecological function of adjacent lands for PPS natural heritage features and areas been taken into account?	☐	☐	
17. Has the future land use of the surrounding lands (i.e., lands not part of the natural heritage system) been considered in evaluating the adequacy of patch size and shape?	☐	☐	

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Natural Heritage System Checklist *(continued from previous page)*

NATURAL HERITAGE SYSTEM CHECKLIST			
QUESTIONS	**YES**	**NO**	**COMMENTS**
REPRESENTATION Representation is one of the fundamental concepts of protecting biodiversity and is used by the national and provincial parks systems as a means of measuring the adequacy of protected areas. This is more appropriate on a larger scale (e.g., municipal-wide) and more feasible outside urban areas.			
18. Has the natural heritage system project included an analysis of the range of landforms and major vegetation types and sought to include examples of each in the natural heritage system? This may require "building" on small remnants in under-represented landscapes (often tableland woodlands are poorly represented in systems based solely on remnant features).	☐	☐	
CONNECTIVITY			
19. Are all major natural features connected within the natural heritage system, where ecologically appropriate?	☐	☐	
20. Are the connections ecologically functional (i.e., are they sufficiently wide and do they have appropriate vegetative cover to function as linkages for the species of flora and fauna intended)?	☐	☐	
21. Is the natural heritage system adequately and appropriately connected to features or other natural heritage systems beyond the study area?	☐	☐	
22. Has the future land use of the surrounding lands (i.e., lands not part of the natural heritage system) been considered in evaluating the identified connections?	☐	☐	
23. Are connections identified that have the potential for enduring, e.g., through coexistence with agriculture?	☐	☐	
24. Do connections identified on the basis of future restoration or improvement have reasonable potential for implementation, e.g., through stewardship?	☐	☐	
25. Has mutual compatibility with activities relating to the management or use of resources been examined and described?	☐	☐	

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Natural Heritage System Checklist *(continued from previous page)*

NATURAL HERITAGE SYSTEM CHECKLIST

QUESTIONS		YES	NO	COMMENTS
BIODIVERSITY: SPECIES WITH SPECIAL NEEDS, RARE VEGETATION COMMUNITIES				
26. Are species with special needs accommodated in the natural heritage system? For example:	a. area-sensitive species	☐	☐	
	b. species with special habitats (e.g., cliffs and raptor nesting areas)	☐	☐	
	c. species that need to move among several habitats to persist (e.g., many frogs)	☐	☐	
	d. species at risk	☐	☐	
27. Have rare vegetation communities been included? For example:	a. alvars	☐	☐	
	b. tallgrass prairies	☐	☐	
	c. savannahs	☐	☐	
	d. rare forest types, including old growth	☐	☐	
	e. talus slopes	☐	☐	
	f. rock barrens	☐	☐	
	g. sand barrens	☐	☐	
	h. Great Lakes dunes	☐	☐	

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

A.4 Comprehensive Approach to Planning for a Natural Heritage System

Natural heritage systems can be identified through a variety of approaches. In the past, natural heritage systems have been derived by working with maps and aerial photographs to delineate features and connections. Advancements in computer technology (e.g., GIS, orthophotography) have provided new tools for augmenting traditional approaches or developing new methods for identifying natural heritage systems. In some approaches, scoring or size criteria may be used to evaluate the inclusion of features or land within the system, and the evaluations can be facilitated by GIS analysis. A more recent innovation is the modelling of natural heritage systems using conservation planning computer software as a decision support tool.

One of the most high-profile exercises related to natural heritage systems planning is the Great Lakes Conservation Blueprint. It is a computer-based analysis that identifies specific areas that will help conserve biodiversity in the Great Lakes region of Ontario. The blueprint includes maps that show the existing ecological systems in each ecodistrict or tertiary watershed. The maps also show parks and protected areas, other designated natural heritage lands, and unprotected lands that, if conserved, would sustain an aspect of the biodiversity of the region. The blueprint contains charts of detailed information about the species and ecosystems in these areas appendix B.1.2).

Building on this work in 2006/07, MNR pilot tested a modelling and scenario-based approach for identifying natural heritage systems (see the MNR discussion paper [2006] for details). The expertise gained through these pilot studies and recent planning initiatives enables MNR to provide enhanced guidance on the identification of natural heritage systems. Users of the manual should contact MNR for the latest information on natural heritage systems and associated approaches.

A.4.1 Principle of Collaboration

MNR's pilot studies for natural heritage systems (2006/07) demonstrated the importance of engaging stakeholders and planning partners, including provincial ministries, in the design and development of a natural heritage system. The description of the process below does not elaborate on stakeholder engagement because a planning authority will want to design a process with which it is comfortable. In general, MNR advises that stakeholder participation during the preliminaries and at strategic points in the process is critical, and full collaboration among agencies with associated interests is invaluable.

A.4.2 Natural Heritage System Process Steps

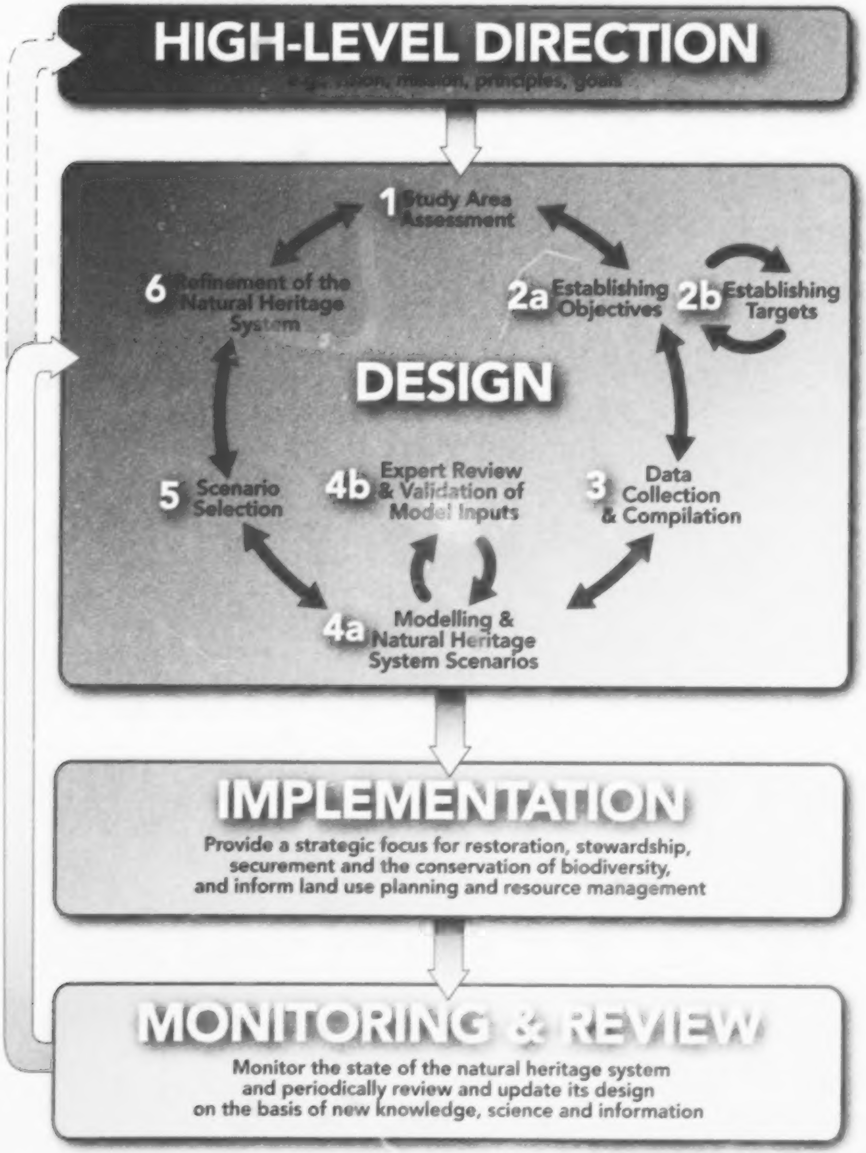
A process for identifying a natural heritage system based on sound scientific theories and methods, an understanding of the planning area, and reliable data weighed and analyzed by experts in the field will improve the validity of the system and its acceptance among stakeholders. A sound methodology for natural heritage system development should incorporate the ecological concepts outlined in appendix A.2 and produce results that are defensible to stakeholders.

MNR's pilot work in modelling natural heritage systems was used to develop the recommended process for natural heritage system planning. MNR carried out the pilot work at the landscape scale of an ecodistrict, but the stages (design, implementation and monitoring) and steps described below have been applied in other examples of systematic conservation planning. Several of the steps are intended to be iterative, that is, they can be revisited as new data becomes available or data is adapted as knowledge is obtained through other steps. The recommended process steps for natural heritage system planning are outlined in figure A-1 and discussed in the pages that follow.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Figure A-1: Process for a Coordinated, Integrated and Comprehensive Approach for Natural Heritage Systems


HIGH-LEVEL DIRECTION
e.g. vision, mission, principles, goals
1 Study Area Assessment
2a Establishing Objectives
2b Establishing Targets
6 Refinement of the Natural Heritage System
DESIGN
5 Scenario Selection
4b Expert Review & Validation of Model Inputs
3 Data Collection & Compilation
4a Modelling & Natural Heritage System Scenarios
IMPLEMENTATION
Provide a strategic focus for restoration, stewardship, securement and the conservation of biodiversity, and inform land use planning and resource management
MONITORING & REVIEW
Monitor the state of the natural heritage system and periodically review and update its design on the basis of new knowledge, science and information

A.4.2.1 Establishing High-Level Direction

Planning authorities should establish what they want to accomplish in their jurisdictions through the identification of natural heritage systems, including being consistent with the PPS and supporting or complementing provincial plans. This groundwork is fundamental to ensuring that the design steps described below have focus and bounds. A visioning exercise can promote collaboration and provide opportunities for reaching consensus, thus supporting buy-in at the implementation stage.

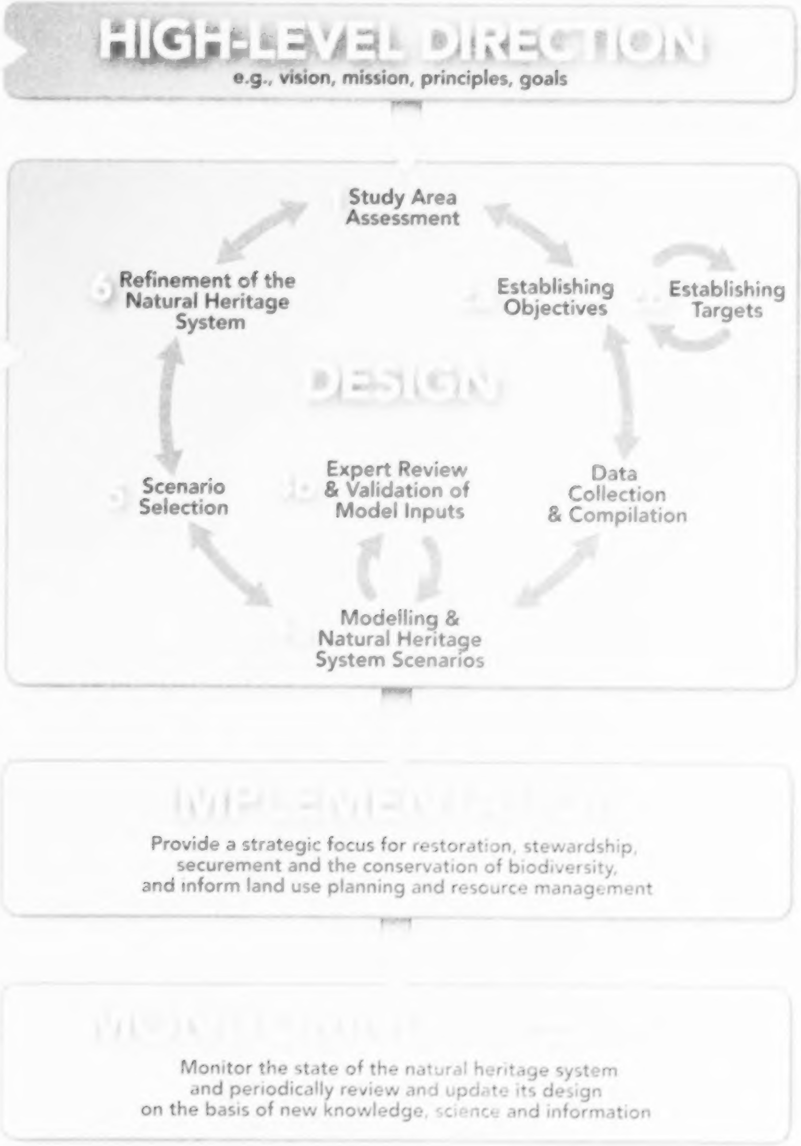
Visioning for natural heritage systems is done with the assumption that efforts such as planning, restoration, stewardship and securement will be used for maintaining and improving natural heritage systems. For example, MNR has proposed that the desired future state of natural heritage systems in that part of Ontario south of the Canadian Shield be represented by the following vision statement: natural heritage systems "will effectively conserve biodiversity, including composition structure and function, and support a high quality of life in Southern Ontario" (MNR, 2006).

A vision statement developed to guide planning for a natural heritage system must take into account PPS policy 2.1.2 and other relevant policies in the PPS. An approach that focuses on a narrow set of habitat elements or natural features may identify only components of a natural heritage system rather than a fully functioning system. Conversely, some planning authorities may wish to address additional interests such as recreation, important landscapes and rural character. Such interests are typical of those found in greenway systems and are broader in scope than what is contemplated as natural heritage systems under policy 2.1.2 of the PPS. For land use planning, planning authorities must ensure that the inclusion of broader interests is consistent with the PPS.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Figure A-1: Process for a Coordinated, Integrated and Comprehensive Approach for Natural Heritage Systems


HIGH-LEVEL DIRECTION
e.g., vision, mission, principles, goals
DESIGN
1 Study Area Assessment
2 Establishing Objectives
Establishing Targets
Data Collection & Compilation
Modelling & Natural Heritage System Scenarios
Expert Review & Validation of Model Inputs
Scenario Selection
6 Refinement of the Natural Heritage System
IMPLEMENTATION
Provide a strategic focus for restoration, stewardship, securement and the conservation of biodiversity, and inform land use planning and resource management
MONITORING
Monitor the state of the natural heritage system and periodically review and update its design on the basis of new knowledge, science and information

A.4.2.1 Establishing High-Level Direction

Planning authorities should establish what they want to accomplish in their jurisdictions through the identification of natural heritage systems, including being consistent with the PPS and supporting or complementing provincial plans. This groundwork is fundamental to ensuring that the design steps described below have focus and bounds. A visioning exercise can promote collaboration and provide opportunities for reaching consensus, thus supporting buy-in at the implementation stage.

Visioning for natural heritage systems is done with the assumption that efforts such as planning, restoration, stewardship and securement will be used for maintaining and improving natural heritage systems. For example, MNR has proposed that the desired future state of natural heritage systems in that part of Ontario south of the Canadian Shield be represented by the following vision statement: natural heritage systems "will effectively conserve biodiversity, including composition, structure and function, and support a high quality of life in Southern Ontario" (MNR, 2006).

A vision statement developed to guide planning for a natural heritage system must take into account PPS policy 2.1.2 and other relevant policies in the PPS. An approach that focuses on a narrow set of habitat elements or natural features may identify only components of a natural heritage system rather than a fully functioning system. Conversely, some planning authorities may wish to address additional interests such as recreation, important landscapes and rural character. Such interests are typical of those found in greenway systems and are broader in scope than what is contemplated as a natural heritage system in policy 2.1.2 of the PPS. For land use planning, planning authorities must ensure that the inclusion of broader interests is consistent with the PPS.

Once a vision statement is set, planning authorities will want to describe how they intend to achieve the vision. This may be done by defining a mission statement, goals and objectives to be achieved and/or a work plan.

For site-specific land use planning matters, a visioning exercise may not be necessary, particularly if the planning authority has adopted a natural heritage system for its jurisdiction. In such a case, a site-specific matter would be assessed for conformity to the official plan. Regardless of whether the planning authority has incorporated mapping and policies for a natural heritage system into its official plan, the site-specific matter would need to be assessed for consistency with the PPS (e.g., whether the proposed development maintains, restores or where possible improves the connectivity of natural features in an area). Appendix A.2 identifies many concepts that should be considered at the site-specific level.

A.4.2.2 Design

Step 1 – Study Area Assessment

Ideally, the study area for natural heritage system planning would be selected to provide appropriate ecological, social and economic context for the scale of the analysis. Examples of this type of study area are ecodistricts, watersheds and subwatersheds.

Municipal boundaries do not truly suit an ecological context, but work on designing natural heritage systems is often done using the boundaries of regional municipalities, counties, lower-tier municipalities, block plans and secondary plans. This approach is workable, as long as the larger landscape context is taken into account. For example, a natural heritage system approach for a secondary plan should evaluate the role and function of natural heritage features and connections in the context of an ecologically defined unit (e.g., the watershed or ecodistrict) and a larger planning area or region, not just in the context of the secondary plan boundaries.

Background analysis is done to gather information that will help to inform target setting and, ultimately, the incorporation of elements of biodiversity within the systems. It is important to understand the variety of ecosystem types that exist or should exist in a particular study area in order to set ecological targets in step 2b.

It is also important to be aware of natural heritage systems already identified at a landscape or broader planning area level. Local-level natural heritage systems should refine, enhance and/or nest appropriately within systems designed for the broader scale. Approaches for local-level natural heritage systems can achieve some consistency across jurisdictions if they have regard for the approaches used at the broader scale.

The proportion of a planning area identified as a natural heritage system may vary in relation to the physical and biological character of the area, the pattern of settlement and landscape alteration and the extent to which there is a planning commitment to urban form development.

Where few natural areas remain, identifying a connected natural heritage system may not be possible except where efforts are made to encourage restoration or rehabilitation. In such parts of the province, the emphasis should be on protecting most of the remaining natural area and lands surrounding it where natural cover can be improved or restored. In areas where natural vegetation covers a large portion of the total land base and little development activity occurs, the relative proportion of the remaining natural cover that is identified for inclusion in the system may be lower. In such areas, in contrast to areas where little natural cover remains, the opportunity to conserve large, highly functional cores of habitat still exists. This high functionality will allow the core areas to act as a source rather than a sink for interior species, will provide habitat for wide-ranging species and will be more resilient to natural disturbance regimes.

Step 2a – Establishing Objectives

The planning authority, working with qualified professionals, should identify the types of features or elements that are to be included or excluded in its natural heritage systems, and any types of existing or approved land uses or resource areas that may be subject to other planning considerations. Then, high-level objectives should be identified for each type of feature or element. These objectives should indicate the general level of inclusion or exclusion for each feature or element.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

For natural features and areas, the importance of each feature or element and its ecological role in the landscape would be taken into consideration. This will determine the types of features and elements that should be included within the natural heritage system, to the extent possible, and those that may or should remain outside it. In accordance with the PPS, significant features and areas should be key components of natural heritage systems.

The PPS provides policy direction on provincial interests, but it does not prevent planning authorities and decision makers from going beyond the minimum standards, unless doing so would conflict with any policy of the PPS. As a result, planning authorities and other users may also wish to include natural heritage features and areas that are significant within a local or regional context, such as the following:

- habitat that supports species of flora and fauna that may be locally common but not tolerant of urban conditions, and that has a position in the landscape validating its inclusion (e.g., connection to another feature or element)
- areas having higher quality locally common habitat that contributes significantly to the quality and diversity of a natural heritage system
- areas of locally or regionally rare habitat

In determining objectives for such habitats, however, the maintenance and improvement of local and/or regional biodiversity must be considered in conjunction with provincial interests broader than natural heritage (s. 2 of the Planning Act identifies provincial interests).

The objectives for what to exclude or avoid, if possible, in a natural heritage system should be based on the degree to which it can coexist with various land uses. This may include land uses that would have some degree of negative impacts on the system. For example, aggregate extraction may be included in the objectives where final rehabilitation presents opportunities to restore or improve connectivity. Similarly, areas set aside for passive recreational use, such as hiking and nature viewing, that are managed properly could be incorporated when they contribute to the social benefits of a natural heritage system.

Step 2b – Establishing Targets

Targets based on ecological and socio-political inputs establish the desired quantity of the objectives developed in step 2a. The study area assessment conducted in step 1, along with gap analysis, can be used to help determine appropriate targets. They might relate to factors such as how much of the area of existing woodland communities should be "captured" by a natural heritage system. For example, targets could be a specific percentage of a given woodland type, all woodlands greater than a certain number of hectares, a specific percentage of riparian zones or all existing tallgrass prairie.

Ecological expertise (i.e., someone with a technical or university degree in ecology, biology, geography or environmental science, ideally with a specialization in landscape ecology or conservation biology) informed by gap analysis is critical in the setting of these targets.

Some prioritizing of target values may need to be done, because maximizing all potential features and elements within an identified natural heritage system is unlikely. Due to time and budget limitations, analyzing all factors and values is also unlikely.

Other land use considerations will affect steps 5 and 6 of the design process. Nonetheless, socio-political inputs will need to be made at this stage, based on the objectives for what should be included in and excluded from a natural heritage system. Applicable provincial plans and policies regarding these inputs may also need to be considered.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Step 3 – Data Collection and Compilation

The identification of natural heritage systems relies on data that is fit for its intended use (e.g., relevant, accurate). A planning authority should compile biophysical and socio-economic information that is fit for the purposes of identifying the natural heritage system, in digital data layers (see appendix B) to the extent possible across the entire area, including the following:

- streams, lakes and other surfacewater features
- soil and geological information
- hydrogeological information
- topography, steep slopes and landforms
- forest cover
- vegetation types
- wetlands (provincially significant and other wetlands)
- wildlife habitat
- fish and wildlife populations
- rare species and plant communities
- ANSIs
- areas of existing development, including built-up areas and approved urban boundaries
- permitted recreational uses
- designated recreational use areas (e.g., natural parks, other parkland, beaches, trails)
- mineral aggregate resources
- mineral aggregate operations, surface mineral mining operations and associated rehabilitation plans
- mineral resources
- prime agricultural areas
- prime agricultural land with specialty crop areas distinguished (if applicable)
- areas of agricultural uses (including crop growing, nurseries and horticulture; raising of livestock, poultry, fish and other animals for food, fur or fibre; associated on-farm buildings and structures)
- information about bordering or overlapping natural heritage systems
- species habitat requirements
- environmentally significant areas identified by a conservation authority or municipality
- hazard lands

Much of this information can be obtained from the LIO and the NHIC, and further support generally is available from local MNR district offices (see appendix B). Other sources of useful information include the following:

- SOLRIS or, where SOLRIS is not available or does not provide the needed information, FRI, OBM and National Topographic Series mapping
- aerial photography
- MMAH publications
- MNDM staff (resident geologists), MNDM publications and MNDM/Ontario Geological Survey databases
- OMAFRA publications including those about soil surveys, municipal drains and artificial tile drainage
- information from conservation authorities
- scientific publications
- existing EISs/reports
- environmental assessments
- information gathered by source protection committees for source protection planning under the Clean Water Act
- information from the private sector (e.g., information obtained through partnerships with forestry and mining sectors)
- information from naturalist groups

Planning authorities need to confirm the fitness of the information acquired from the above sources for identifying the natural heritage system. Where possible, field investigations should be done to refine the location and extent of natural heritage features. In addition, planning authorities should, wherever possible, improve the fitness (e.g., accuracy, currency) of the available data on the basis of information they obtain (e.g., upload information to provincial databases and enhance ELC base layers).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Adapting to information gaps

In areas where data or resource mapping are not fit for the purposes of natural heritage system identification, planning authorities may have to look at other ways of identifying natural heritage features and areas for potential inclusion in a natural heritage system. Sometimes criteria can be used to identify potentially significant natural heritage features or areas until more site-specific information is available to verify their precise location. For example, woodlands of a certain size and type can be identified, even if their precise boundaries are unknown, in which case planning authorities may wish to define the boundaries broadly and provide for more specific delineation as part of the development application review process. In addition, research and testing continues for rapid and/or remote evaluation techniques that may serve to identify potentially significant features and areas. ELC at the community series level may be used to indicate important features and areas.

Map scale

The mapping scale at which the natural heritage system is being planned often determines the required level of accuracy. Broad regional scale studies are often based on very general natural heritage information. Planning authorities generally use 1:50,000 to 1:10,000 scale mapping for these regional studies. A more detailed delineation of natural features and areas, based on a mapping scale of 1:2,000 can be deferred to a more detailed planning stage (i.e., subdivision plan, secondary plan).

Recreation and other socio-economic aspects

Natural heritage systems can provide benefits in terms of supporting diverse socio-economic activities and values (recreational, educational, cultural, historical, aesthetic and spiritual). While these benefits may be protected wherever feasible, pressures that human activity create will need to be taken into account and managed to ensure sustainable use that does not degrade the resource.

Step 4a – Modelling and Natural Heritage System Scenarios

Data from step 3 are analyzed on the basis of the objectives and targets set in step 2 to produce multiple natural heritage system scenarios or options (where the landscape is diverse enough to support distinct scenarios). Data analysis may reveal the need to revisit the objectives set in step 2.

MNR suggests that modelling using readily available conservation planning software is a good tool for analyzing data. In this way, computer-generated scenarios can be developed by using the conservation planning software to test variations of the objectives and other inputs.

When modelling is not the methodology chosen to analyze data and produce natural heritage system scenarios, other approaches should be used for this step. This could mean adopting an alternative approach to produce scenarios, as described in the beginning of this part of appendix A.4.

Ideally, the next steps should produce maps and statistical descriptions of the natural heritage system scenarios. Where using modelling in the approach is not feasible, other spatial analysis should be used to the extent possible to produce scenarios of natural heritage systems. Analysis that is not based on modelling may focus only on existing conditions and not be able to factor in potential conditions (i.e., ecological targets).

This step can involve considerable preparation of data to provide inputs that address matters of biodiversity. Results of modelling or GIS analyses by some conservation authorities and for the Nature Conservancy's Great Lakes Conservation Blueprint may be useful here or in steps 5 and 6.

Step 4b – Expert Review and Validation of Model Inputs (if modelling tools were used)

Experts who are involved in the process are essential for validating all the data sources, assumptions and parameters used in the model, thus providing confidence that the modelling will achieve the established objectives. Typically, steps 4a and 4b will involve many iterations.

Step 5 – Scenario Selection

Once step 4 has concluded, a broader evaluation of the natural heritage system scenarios should occur. The scenarios need to be reviewed in terms of the principles described above and the vision developed for the natural heritage system. This evaluation should have a public component if a natural heritage system is being identified for broader rather than site-specific land use planning matters.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Maps and reports should be provided to assist in the evaluation of the scenarios. Reports could provide some statistics on how well each scenario met the objectives and targets (e.g., percentage of the study area captured by the system, or percentage of the total area of PSWs within the study area captured by the system). Professional conservation biologists would be able to identify the ecological implications of choosing one scenario over another.

The evaluation should make possible the identification of a preferred scenario. Planning authorities should keep in mind the precautionary principle, because there is much that humankind does not understand about ecological processes and climate change.

Step 6 – Refinement of the Natural Heritage System

The natural heritage system scenarios discussed in steps 4 and 5 may depict systems in a generalized way. Once the preferred scenario is identified in step 5, hands-on work should be done to fine-tune the boundaries of the systems. For example, the boundaries should relate appropriately to natural features and associated areas promoting ecological integrity, as well as to protected area components of the landscape that are meant to be included in the systems (e.g., a conservation area) or components to be excluded from the systems (e.g., land devoted to residential use). Connecting links and lands promoting ecological integrity can often be identified along well-defined natural features such as stream valleys, steep slopes or wooded areas and on sites known to be suitable for restoration or improvement through stewardship.

If natural heritage systems are being designed for a large area (e.g., an entire municipality or region), then the scale of mapping would not facilitate illustrating areas such as buffers, but they can be addressed in the accompanying text and policies. A natural heritage system being prepared on a watershed, concession block or similar planning area can, in contrast, more accurately address areas such as buffers and surfacewater catchments that are relevant to the system.

A.4.2.3 Implementation

The development of a natural heritage system should inform and support land use planning and resource management while providing a strategic focus for restoration, stewardship, securement and the conservation of biodiversity.

Planning authorities will need to continue to work with stakeholders to ensure that implementation of the system achieves the vision outlined at the beginning of the process.

A.4.2.4 Monitoring

The PPS does not state that natural heritage systems must be monitored. However, policy 4.11 of the PPS encourages municipalities to establish performance indicators to monitor the implementation of the policies in their official plans. A monitoring program is important to improving our knowledge of natural systems, how they function and how they respond to impacts.

Natural systems are dynamic and change over time. They may also change as a result of human forces. For these reasons, natural heritage systems may need to be refined periodically. By monitoring key performance indicators, planners should be able to identify the extent to which natural heritage systems are achieving objectives and targets, and thus when refinement is required.

A monitoring program should include:

- a process for reviewing and incorporating the findings of new scientific research on natural heritage systems;
- documentation of the protocols for data collection;
- schedules and field requirements (including required expertise for data collection and analysis);
- a mechanism for data storage and access by appropriate people, organizations or agencies;
- a process for quality assurance and control;
- a process and schedule for periodically analyzing the monitoring data;
- a mechanism for initiating a response to trends and findings from the analysis;
- identification of responsibilities for data collection, storage, analysis and reporting; and
- a protocol for documenting findings and reporting them to the appropriate agency (e.g., municipality, NHIC, MNR district office, MOE or conservation authority).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

A monitoring plan, addressing each of the items noted above, should be included as an integral part of each natural heritage system, as monitoring is key to the long-term success of a natural heritage system.

In developing a monitoring plan, an organization should give consideration to the feasibility of implementing it. Long-term performance monitoring of land use and resource management plans is often recommended, but frequently there are constraints on funding and capacity within the organization. Thus, the design of a monitoring plan should take into account:

- the capacity of the organization that is to be responsible for the monitoring; and
- the funding available to commit to a monitoring plan (which is often long-term).

Monitoring plans need to be efficient by prioritizing the aspects of the natural heritage system that need to be monitored. Sometimes a compromise may need to be made between monitoring a complete suite of factors (which may be justifiable from a scientific perspective) and a scaled down plan that will provide the essential information for identification of problems. If problems are identified, studies that are more rigorous can be implemented.

A monitoring program that avoids complex measurement or protocols requiring specialist skills is more likely to be implemented. Another advantage of an easily implemented monitoring program is that volunteers could implement it, which would improve fiscal feasibility and could increase public awareness and support for natural heritage systems by involving the public.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

APPENDIX B: NATURAL HERITAGE INFORMATION SOURCES

B.1 Natural Heritage Information Sources Overview

To support planning authorities and proponents in identifying and evaluating natural heritage (see section 4.2.1), provincially available information sources are provided below, organized by PPS natural heritage policy areas. Table B-1 discusses PPS natural heritage policy areas and provides direction on how to apply information sources. Information sources are summarized in B.1.1, and details on the sources and their use are provided in B.1.2. The suggested information sources are not exhaustive. Additional information sources (e.g., a local naturalist group) may need to be consulted when further information on a particular natural heritage feature or area is needed. Questions on the proper use of MNR's data for municipal land use planning purposes should be addressed to the local MNR district office.

Where possible, a hyperlink is provided to the source data or document. Efforts will be made to keep this information current. Users of this manual are encouraged to visit MNR's Municipal Planning in Ontario webpages (see table B-2) to obtain the most current list of information sources contained in the manual. This list is current as of March 31, 2010.

Table B-1: Applying Information Sources to Support PPS Natural Heritage Policy Areas

PPS NATURAL HERITAGE POLICY AREA	DISCUSSION
General natural heritage	Information sources listed can be used to support the general implementation of natural heritage policies of the PPS. Where general information sources can also support specific natural heritage policies of the PPS, they are listed under the relevant natural heritage policy area in table B-2.
Natural heritage systems	Definitive provincial information sources for natural heritage systems are not identified for the purposes of the PPS. In planning for natural heritage systems, a planning authority will need to select from existing available data or develop new information that will contribute to or fully cover the key components of a natural heritage system (see section 3.4). If a planning authority undertakes a comprehensive study to identify a natural heritage system, an important element of the study should be identification of the necessary information sources used to derive the system. Information sources can be divided into two categories: 1. baseline data – sources that identify what exists on the ground (e.g., forest, wetland types) 2. derived data – sources that use baseline data to identify areas of ecological importance (e.g., Great Lakes Conservation Blueprint) that could be incorporated into a natural heritage system

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table B-1 *(continued from previous page)*

PPS NATURAL HERITAGE POLICY AREA	DISCUSSION
Significant habitat of endangered and threatened species	For the purposes of the PPS, MNR approves the significant habitat of endangered and threatened species (see section 5.3). Information on endangered and threatened species is considered sensitive, and only generalized species data will be made available to planning authorities unless their staff members have up-to-date data sensitivity training, which MNR offers through the NHIC.
Significant wetlands and significant coastal wetlands	For the purposes of the PPS, PSWs are those areas MNR identifies and confirms using the OWES (see section 6.3). Not all wetlands have been evaluated. When a development application involves an unevaluated wetland that has characteristics typical of a significant wetland, the planning authority should ensure, before processing any planning approvals, that a qualified professional who has received up-to-date MNR OWES training evaluates the wetland.
Significant woodlands	Definitive information sources for significant woodlands are not identified for the purposes of the PPS. In planning for significant woodlands, a planning authority should use the best available data or develop new information that will contribute to or fully cover the recommended evaluation criteria for significant woodlands (see section 7.3). If a planning authority undertakes a comprehensive study to identify significant woodlands, an important element of the study should be the identification of the necessary information sources used to derive the features.
Significant valleylands	Definitive information sources for significant valleylands are not identified for the purposes of the PPS. In planning for significant valleylands, a planning authority will need to select from existing available data or develop new information that will contribute to or fully cover the recommended evaluation criteria for significant valleylands (see section 8.3). If a planning authority undertakes a comprehensive study to identify significant valleylands, an important element of the study should be the identification of the necessary information sources used to derive the features.

(continued on next page)

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table B-1 (*continued from previous page*)

PPS NATURAL HERITAGE POLICY AREA	DISCUSSION
Significant wildlife habitat	While definitive information sources for significant wildlife habitat are not identified for the purposes of the PPS, MNR has substantial guidance material. In planning for significant wildlife habitat, a planning authority will need to select from existing available data or develop new information that will contribute to or fully cover the recommended evaluation criteria for significant wildlife habitat (see section 9.3). If a planning authority undertakes a comprehensive study to identify significant wildlife habitat, an important element of the study should be the identification of the necessary information sources used to derive the features. Some specific information sources that could be used to support evaluation and identification of significant wildlife habitat are listed below in table B-3. In the absence of a comprehensive municipal approach, MNR district offices may provide recommendations to planning authorities. Information on significant wildlife habitat can vary considerably by species on the basis of factors such as time and location. This variation and the small scale of many significant habitats result in a need for planning authorities or proponents generally to collect information at the site level when a development is proposed (see section 9.3.2).
Significant areas of natural and scientific interest	For the purposes of the PPS, ANSIs are features and areas that MNR identifies and confirms using the life science and earth science frameworks as outlined in MNR's Identification and Confirmation Procedure for Areas of Natural and Scientific Interest. ANSIs that MNR has identified and recommended for protection but that have not been formally confirmed through a confirmation procedure are referred to as "candidate ANSIs." For the purposes of the PPS, an ANSI is not considered provincially significant until it is confirmed (see section 10.3).
Fish habitat	Definitive information sources for fish habitat, as defined by the Fisheries Act, are not identified for the purposes of the PPS, except for the identification of lake trout lakes. In planning for fish habitat, a planning authority will need to select from existing available data or develop new information that will contribute to or fully cover the recommended identification features for fish habitat (see section 11.3). For plan review purposes, both broadscale and detailed habitat information is needed to ensure that a specific proposed development does not negatively affect fish habitat. In some areas of the province, fish habitat has not been characterized and seeking information at a site level is critical. Where no detailed fish habitat mapping has been completed, all waterbodies, including permanent or intermittent streams, headwaters, seasonally flooded areas, municipal or agricultural surface drains, lakes and ponds (except human-made off-stream ponds) should be considered fish habitat unless it can be demonstrated to the satisfaction of the approval authority under the Planning Act that the feature does not constitute fish habitat as defined by the Fisheries Act.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

rmation Sources Summary by PPS Natural Heritage Policy Area

des a summary of PPS natural heritage information sources. Information sources are organized by type (provincial government offices/ servation organizations, manuals/guidelines, internet, data layers[63]). See appendix B.1.2 for descriptions of individual information ons on their use and hyperlinks (if available) to online material.

mary of PPS Natural Heritage Information Sources

NFORMATION SOURCE (e appendix B.1.2 for descriptions f individual information sources)	PPS NATURAL HERITAGE POLICY AREA RELEVANCY							
	Natural Heritage Systems	Significant Habitat of Endangered and Threatened Species	Significant Wetlands and Significant Coastal Wetlands	Significant Woodlands	Significant Valleylands	Significant Wildlife Habitat	Significant Areas of Natural and Scientific Interest	Fish Habitat
Land Information Ontario	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MNR District Offices	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Natural Heritage Information Centre	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Conservation Authorities	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes
Adaptive Management of Stream Corridors in Ontario	N/A	N/A	N/A	N/A	Yes	N/A	N/A	Yes
Ecological Land Classification Manuals	Yes	N/A	Yes	Yes	Yes	Yes	N/A	N/A
Ontario Wetland Evaluation System Manuals	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A
Significant Wildlife Habitat Technical Guide with Draft Ecoregion Criteria Schedules Addendum	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A
Significant Wildlife Habitat Decision Support System	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A

(continued on next page)

---

ses the term "data layer" in a general GIS application sense to describe geospatial information sources. Data custodians may use different with intended technical meaning (e.g., data classes, datasets).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

s page)

N SOURCE or descriptions tion sources)	Natural Heritage Systems	Significant Habitat of Endangered and Threatened Species	Significant Wetlands and Significant Coastal Wetlands	Significant Woodlands	Significant Valleylands	Significant Wildlife Habitat	Significant Areas of Natural and Scientific Interest	Fish Habitat
	PPS NATURAL HERITAGE POLICY AREA RELEVANCY							
ng in Ontario MNR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
s at Risk MNR Webpages	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A
ublic Registry Canada Website	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A
	Yes	N/A	N/A	N/A	N/A	Yes	Yes	N/A
e Area Summary and a Layers	Yes	N/A	N/A	N/A	N/A	N/A	N/A	Yes
da's Big Picture	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Model – Version 2.0.0 – Data Layer	Yes	N/A	N/A	Yes	Yes	N/A	N/A	N/A
orest Resources Inventory	Yes	N/A	N/A	N/A	N/A	Yes	N/A	N/A
servation Blueprint for	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
o Land Resource em	Yes	N/A	Yes	Yes	Yes	Yes	N/A	Yes
Land Information Ontario	Yes	N/A	N/A	N/A	N/A	Yes	N/A	N/A
ent Data Layer	Yes	N/A	N/A	Yes	Yes	N/A	N/A	Yes

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

	PPS NATURAL HERITAGE POLICY AREA RELEVANCY							
	Natural Heritage Systems	Significant Habitat of Endangered and Threatened Species	Significant Wetlands and Significant Coastal Wetlands	Significant Woodlands	Significant Valleylands	Significant Wildlife Habitat	Significant Areas of Natural and Scientific Interest	Fish Habitat
	Yes	N/A	N/A	Yes	Yes	N/A	N/A	Yes
vincial	Yes	N/A	N/A	Yes	Yes	N/A	N/A	Yes
	Yes	N/A	Yes	Yes	N/A	Yes	N/A	Yes
	N/A	Yes	N/A	N/A	Yes	Yes	Yes	N/A

and Directions on Use

summarized in table B-2 are provided in tables B-3 to B-7 below, which relate to provincial zations, manuals/guidelines, the Internet and data layers.

n Information Sources

LAND INFORMATION ONTARIO
Ontario (LIO) is a Government of Ontario initiative that manages geospatial data for use in S. LIO includes a variety of online tools and services to support the sharing of geospatial data ccessible centralized data warehouse. The warehouse contains more than 250 spatial data layers organizations and is the primary method for the dissemination of MNR geospatial data.

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

AND INFORMATION ONTARIO

house, users can become members of the Ontario Geospatial Data exchange is free and available to a wide variety of non-profit organizations, tries, municipalities, First Nations communities, federal government ctor organizations such as conservation authorities, NGOs and academic encouraged to become data exchange members so that they can access all pplying specific natural heritage policies of the PPS. Contributors of data nts to their data, including to whom and how access is granted. As a data ities can receive automatic notices when data layer information is updated.

has been created for municipalities that do not belong to the Ontario nce ensures that non-member municipalities can access MNR data sets ther provincial plans. The licence provides access through LIO to specific cipal planning purposes only. Over time, this licence will be phased out and couraged to become a member of the Ontario Geospatial Data Exchange. LIO for information on the Municipal Planning Data Licence.

oordinates the Province's involvement in digital imagery acquisition. s location, high-resolution digital imagery may be available, or the Province artnership with the planning authority to acquire new digital imagery.

tion report is available at
ess/LIO/2ColumnSubPage/STEL02_168199.html

h this unrestricted use licence is available at
ess/LIO/2ColumnSubPage/STEL02_168198.html

MNR DISTRICT OFFICES

ta accessible through its online sources, LIO and the NHIC, is current, their local MNR district office to determine if more up-to-date information is t when seeking information for areas identified as significant habitat of significant wetlands and ANSIs (see section 4.2.1) or if undertaking a tural heritage systems and/or natural heritage features and areas.

their local MNR district planner for information on how a comprehensive, proach developed by MNR (see appendix A.4) can assist in identifying and

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

RICT OFFICES

n species and their habitats, and for approving the significant
dangered and threatened.

reatened species is small scale and unlikely to be known
, some MNR district offices have developed generalized
hreatened species and their habitats that can be used to help
eatened species that may be present within or near an area

basis of initial preliminary screening (see section 5.3.1), that a
affect significant habitat of endangered and threatened
hould contact the local MNR district planner or species at risk
r significant habitat of endangered or threatened species is

g basis. Planning authorities that have questions on the
cific wetlands should contact their local MNR district office.

professional other than MNR staff, planning authorities must
approval of the evaluation.

vith the identification of significant woodlands. Planning
anner for information.

nning authorities should contact their local MNR district
mation.

pecies occurrences is considered sensitive and inventory work
ay be needed for the development approval process.
district planner for more detailed information on known
significant wildlife habitat is present.

ocal MNR district planner if uncertain about the status of an
review and confirm (as appropriate) proposed adjustments to

ecies occurrence and critical fish habitat (where known)

s are considered to be at capacity.

ubPage/STEL02_179002.html

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

ON CENTRE

ibutes data on the province's rare species,
al heritage policies of the PPS.

lata for the province's rare species,
warehouse and web-based mapping

to obtain any existing information that is
ection 4.3).

ties and natural areas should be used

on reported locations[64] of endangered and
screening development applications and
on 5.3.1).

red only on a need-to-know basis as part of
ontacted for information on how to access

ve successfully completed data sensitivity
conservation authorities, non-
rovincial government staff. People wishing

etlands that can complement the available
NR wetland evaluation work is ongoing and
ct offices. Planning authorities should
ict office.

ecies, vegetation communities and natural

ommunities and natural areas to evaluate
ommon characteristics).

(*continued on next page*)

---

te assessment, based on other information sources,

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

ble B-3 *(continued from previous page)*

INFORMATION SOURCE	NATURAL HERITAGE INFORMATION CENTRE
Significant valleylands	• Planning authorities may use NHIC data on rare species, vegetation communities and natural areas to evaluate ecological features (e.g., community and species diversity, habitat value).
Significant wildlife habitat	• The NHIC provides information on special concern species listed on the SARO List, as well as information on rare vegetation communities and seasonal concentration areas that are recognized as significant wildlife habitat in the Significant Wildlife Habitat Technical Guide.
Significant areas of natural and scientific interest	• The NHIC provides descriptive data on ANSIs, including area type, significance level, location, general description, size, relation to other natural areas, vegetation, landforms, representation, ecological function, threats, rare species present and management practices.
Fish habitat	• Planning authorities can use NHIC data on rare species, vegetation communities and natural areas to assist in identifying fish habitat.
Link	• Website: http://nhic.mnr.gov.on.ca/nhic_.cfm

ble B-4: Conservation Organization Information Sources

INFORMATION SOURCE	CONSERVATION AUTHORITIES
General	• Many conservation authorities have developed natural heritage inventories (e.g., wetlands) on a watershed basis, supported by monitoring programs. Planning authorities can use this information in evaluating and identifying natural features and areas. In areas that have a conservation authority, planning authorities should contact its local representative.
Natural heritage systems	• Some conservation authorities have undertaken natural heritage system work that may help planning authorities identify and evaluate natural heritage system components and linkages.
Significant habitat of endangered and threatened species	• Conservation authorities may be able to provide information on natural heritage (e.g., ELC mapping, location of locally rare species) that can assist with the identification of significant habitat of endangered and threatened species.
Significant wetlands and significant coastal wetlands	• Conservation authorities can provide Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulations mapping that may assist in identifying unevaluated wetlands.

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

d from previous page)

ON	CONSERVATION AUTHORITIES
dlands	• Conservation authorities can provide floodline mapping and Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulations mapping that a planning authority may use to evaluate certain aspects of the recommended criteria for ecological function (e.g., water protection, linkages). • Planning authorities can use information on natural heritage available from conservation authorities to evaluate certain aspects of the recommended criteria for uncommon characteristics (e.g., uncommon community types).
ylands	• Conservation authorities can provide floodline mapping, hazard land mapping and Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulations mapping that a planning authority may use to evaluate geomorphological features (e.g., surface- and groundwater functions). • Information on natural heritage that can be used to evaluate ecological features (e.g., community and species diversity, habitat value) may be available from conservation authorities.
vildlife abitat	• Conservation authorities may be able to provide information on natural heritage (e.g., ELC mapping, location of locally rare species) that can be used to delineate significant wildlife habitat.
abitat	• Conservation authorities collect and maintain fish and fish habitat information for implementing the Conservation Authorities Act, watershed, subwatershed and source protection planning, and for reviewing site-specific development applications. • Conservation authorities can provide floodline mapping, hazard land mapping and Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulations mapping that a planning authority may use to evaluate water features (e.g., surface- and groundwater functions) that support fish habitat. • Conservation authorities, in cooperation with MNR, may have prepared watershed-based fisheries management plans for some areas that can provide habitat information and restoration opportunities.
Link	• Conservation Ontario website: http://conservation-ontario.on.ca

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

DAPTIVE MANAGEMENT OF STREAM CORRIDORS IN ONTARIO INCLUDING NATURAL HAZARDS TECHNICAL GUIDES, AND UNDERSTANDING NATURAL HAZARDS

Documents provide direction on identifying valleylands boundaries, as well as valley morphology e.g., floodplains, meander belts, valley slopes).

Documents provide guidelines for preparing subwatershed plans and stormwater management plans. Planning authorities should refer to these documents when developing land use planning direction for development and site alteration occurring within the drainage area of a watercourse that has the potential to affect fish habitat, orimarily by altering the hydrological cycle (changing the amount of water infiltrating into the ground versus unning across the land surface) or the quality of runoff (nutrients, suspended sediment, temperature, trace contaminants).

Documents provide direction on the concept of meander belt allowances used in determining the extent of adjacent lands from a particular fish habitat feature, as recommended by the Province (see section 11.4).

ittp://www.iwsstore.ca/publication_5.asp

ittp://www.mnr.gov.on.ca/en/Business/Water/Publication/MNR_E002317P.html

ECOLOGICAL LAND CLASSIFICATION MANUALS

ELC community boundaries may be delineated and compiled digitally for some planning areas. ELC community ooundaries are important baseline data for natural heritage system identification and analysis.

The ELC definition for "forest" based on greater than 60 percent tree cover can be used to delineate woodland oatches (see section 7.3.2) in combination with the Forestry Act definition for "woodland."

ELC community boundaries can be used to evaluate ecological features (e.g., community and species diversity, nabitat value).

To support the ELC of a development proposal site (including adjacent lands) to the finest ELC level practical, the Province has developed regional manuals that provide a process for identifying and delineating ecologically oased land units. In areas outside of southern Ontario (north of Ecoregions 6E and 7E), the FEC should be used for classifying forested habitats. In non-forested northern habitats, every effort should be made to use the southern Ontario ELC manual for classification (see section 9.3.2). ELC and FEC regional manuals are listed below.

ELC community boundaries can be used to support identifying fish habitat as defined by the Fisheries Act.

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

ECOLOGICAL LAND CLASSIFICATION MANUALS

ssification for Southern Ontario (Lee et al., 1998):
on.ca/MNR/nhic/communities/comm_elc.cfm

st Ecosystems of Central Ontario (Chambers et al., 1997) (*Note:* No online source is available.)

rest Ecosystems of Northeastern Ontario (Taylor et al., 2000):
.on.ca/en/Business/NESI/2ColumnSubPage/STEL02_165342.html

Forest Ecosystem Classification for Northwestern Ontario (Sims et al., 1997):
.on.ca/en/Business/NWSI/2ColumnSubPage/STEL02_165394.html

and Ecosites of Northwestern Ontario (Racey et al., 1996):[65]
.on.ca/en/Business/NWSI/2ColumnSubPage/STEL02_165394.html

ONTARIO WETLAND EVALUATION SYSTEM MANUALS

the source for wetland "evaluation procedures" per the PPS definition of "significant"

qualified professionals can identify and evaluate wetlands provided that they use the approved y and have received MNR training in the use of the Province's wetland evaluation system. In all nsible for reviewing and approving the evaluations.

Vetland Evaluation System Manual:
nr.gov.on.ca/View.asp?Document_ID=15728&Attachment_ID=33036

Vetland Evaluation System Manual:
nr.gov.on.ca/View.asp?Document_ID=15728&Attachment_ID=33037

on the interpretation of existing OWES manuals:
nr.gov.on.ca/View.asp?Document_ID=15728&Attachment_ID=33099

g the OWES manuals or available training should be directed to MNR's Biodiversity Section. training course information are available at
nr.gov.on.ca/View.asp?Document_ID=15728&Attachment_ID=33100

(*continued on next page*)

---

t is less suitable because it is not as detailed as the southern ELC system.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

T TECHNICAL GUIDE WITH DRAFT ECOREGION CRITERIA SCHEDULES ADDENDUM

tural Heritage Reference Manual, is a more detailed technical manual that
ion, description and prioritization of significant wildlife habitat.

uire proponents to use the guide when completing an ecological site
tat.

provide criteria for identifying significant wildlife habitat in Ecoregions 5E,
proponents should use as an addendum to the Significant Wildlife Habitat

uide:
/FW/Publication/MNR_E001285P.html

egion Criteria Schedules:
asp?Document_ID=15513&Attachment_ID=32528

v information becomes available. When finalized, it will be made available
Ontario webpage at
/LUEPS/2ColumnSubPage/STEL02_165804.html

DLIFE HABITAT DECISION SUPPORT SYSTEM

on Support System is a computer-based tool that describes wildlife habitat,
cts and provides mitigation measures for a proponent to consider when
wildlife habitat.

/FW/Publication/MNR_E001285P.html

LANNING IN ONTARIO MNR WEBPAGES

on MNR's role in municipal planning, as well as access to relevant
manual that support specific PPS natural heritage policy areas.

/LUEPS/2ColumnSubPage/STEL02_165804.html

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

T RISK MNR WEBPAGES

., habitat protection, permits and agreements), species
n, as well as general information on species at risk in Ontario.

.html

GOVERNMENT OF CANADA WEBSITE

or the purposes of the PPS, general information on
SARO List may be available through federal status reports,

ATA LAYER

tial information source for provincially significant ANSIs.
and confirmed as provincially significant is available from this
tural heritage system identification.

for the purposes of the PPS, this and other information in
ge systems identification.

dlife features and habitat that may be useful in identifying
aluation information, planning authorities should contact

and confirmed as provincially significant is available from this

for the purposes of the PPS, this and other information in
heritage planning (e.g., natural heritage systems).

tario.ca/LIO

through LIO metadata:
D=2148&AgencyID=1&Theme=All_Themes

(continued on next page)

Quick Links

Table of Contents	ii
Abbreviations Used in This Manual	xi
Provincial Policy Statement Implementation	6
Natural Heritage Systems	15
Natural Heritage Features and Areas	37
Significant Habitat of Endangered and Threatened Species	47
Significant Wetlands and Significant Coastal Wetlands	56
Significant Woodlands	63
Significant Valleylands	74
Significant Wildlife Habitat	81
Significant Areas of Natural and Scientific Interest	90
Fish Habitat	94
How to Protect: Municipal Planning Techniques and Tools	107
Addressing Impacts of Development and Site Alteration	118
Provincial Land Use Planning Documents	134
Natural Heritage System Planning	145
Natural Heritage Information Sources	166
Glossary	216
Works Cited	219

RVEY POINT DATA LAYERS

e two separate data layers that provide fish
tem identification.

nd fish species of lakes, rivers or streams and
erbody. The ARA Summary is represented
ter Poly Segment via a unique identification
ation of many sources, including ARA Survey
g ARA Summary information and may have
have been combined into the ARA Summary.

eemed to be at development capacity. Local
data on lake trout lakes at development

s and fish species that pertain to a specific
erized by a single point with associated
an entire waterbody. The information in the
a layer.

es of the PPS, but a planning authority or
t.

identification of fish habitat, depending on

LIO Data Management Model Fact Sheet:
8633&Attachment_ID=16446

yID=1&Theme=All_Themes
ions above and will be revising the fact sheet

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

able B-7 *(continued from previous page)*

INFORMATION SOURCE	CAROLINIAN CANADA'S BIG PICTURE
Natural heritage systems	• Carolinian Canada's Big Picture and Big Picture 2002 are resources that planning authorities in Ecoregion 7E may use for identifying and evaluating natural heritage systems. These projects were undertaken to identify high-value core natural areas and key linkages on the basis of baseline data for southern Ontario, using a replicable rule-based process.
Links	• Original Big Picture: http://www.carolinian.org/ConservationPrograms_BigPicture.htm • Big Picture 2002 (larger spatial extent in southern Ontario): http://nhic.mnr.gov.on.ca/MNR/nhic/projects/BP/bigpict_2002_main.cfm

INFORMATION SOURCE	DIGITAL ELEVATION MODEL – VERSION 2.0.0 – PROVINCIAL TILED DATA LAYER
Natural heritage systems	• This data layer provides three-dimensional raster data that captures terrain elevations and covers the province to the 51st parallel, composed to a resolution of 20 metres in northern Ontario and 10 metres in southern Ontario, that can be used as baseline data for natural heritage system identification.
Significant woodlands	• Data can be used to evaluate certain aspects of the recommended criteria for ecological function (e.g., woodland diversity).
Significant valleylands	• Data can be used to evaluate certain aspects of the recommended criteria for geomorphological features (e.g., prominence as a distinctive landform).
Links	• Geospatial data available through LIO: http://www.ontario.ca/LIO • More information on this data layer is available through LIO metadata: http://lioapp.lrc.gov.on.ca/edwin/EDWINCGI.exe?IHID=4863&AgencyID=1&Theme=All_Themes

INFORMATION SOURCE	FOREST COVER – FOREST RESOURCES INVENTORY UNIT
Natural heritage systems	• The Forest Resources Inventory (FRI) Unit is MNR's primary data layer used to support forest inventory and forest management planning within the geographic boundaries of the Area of the Undertaking under the Crown Forest Sustainability Act. • Planning authorities within the FRI extent may use FRI data as baseline information when identifying and evaluating natural heritage system components and linkages.
Significant wildlife habitat	• Planning authorities within the FRI extent can use FRI data to assist with the identification of candidate significant wildlife habitat.

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

d from previous page)

ON	FOREST COVER – FOREST RESOURCES INVENTORY UNIT
Links	• MNR's Forest Management Planning webpages: http://www.mnr.gov.on.ca/en/Business/Forests/2ColumnSubPage/199556.html • Geospatial data available through LIO: http://www.ontario.ca/LIO • More information on FRI Unit is available through LIO metadata: http://lioapp.lrc.gov.on.ca/edwin/EDWINCGI.exe?IHID=4686&AgencyID=1&Theme=All_Themes

ON	GREAT LAKES CONSERVATION BLUEPRINT FOR BIODIVERSITY
ritage stems	• The Great Lakes Conservation Blueprint is a computer-based analysis that identifies specific terrestrial and aquatic areas derived from baseline data. • The blueprint documents the types of ecological systems that, if conserved, would sustain an aspect of the biodiversity by ecodistrict and tertiary watershed. Planning authorities can use the blueprint to identify and evaluate natural heritage system components and linkages.
Links	• Geospatial data available through LIO: http://www.ontario.ca/LIO • More information is available on the NHIC website: http://nhic.mnr.gov.on.ca/projects/conservation_blueprint/blueprint_main.cfm

ON	SOUTHERN ONTARIO LAND RESOURCE INFORMATION SYSTEM
eneral	• SOLRIS is MNR's primary landcover data layer for landscape-level inventory of natural, rural and urban lands in Ecoregions 6E and 7E. The SOLRIS methodology combines traditional photo interpretation with remote sensing modelling using information available from 2000-2002 to map features at the landscape level.
ritage stems	• SOLRIS provides a comprehensive inventory current to 2002 that is suitable as baseline information when identifying and evaluating natural heritage system components and linkages. Of particular relevance is SOLRIS identification of natural heritage features by type (e.g., wetlands as swamp, bog, fen, marsh) on the basis of MNR's ELC for southern Ontario (see section 15).
tlands oastal tlands	• SOLRIS identification of wetlands by type (e.g., wetlands as swamp, bog, fen, marsh) can be used to identify unevaluated wetlands.

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

page)

SOUTHERN ONTARIO LAND RESOURCE INFORMATION SYSTEM

he SOLRIS landscape-level inventory is suitable as baseline information when identifying and evaluating gnificant woodlands. SOLRIS identification of wetlands by type can be used to evaluate recommended criteria or certain aspects of ecological function (e.g., water protection, linkages).

he SOLRIS landscape-level inventory is suitable as baseline information when identifying and evaluating gnificant valleylands. SOLRIS identification of wooded areas by type can be used to evaluate recommended riteria for certain aspects of ecological function (e.g., restoration potential).

OLRIS identification of natural heritage features by type on the basis of MNR's ELC for southern Ontario ee section 15) can be used to identify candidate significant wildlife habitat.

OLRIS identification of wetlands by type can be used to identify potential fish habitat at a broad scale.

eospatial data available through LIO: http://www.ontario.ca/LIO
lore information on SOLRIS is available through LIO metadata:
ttp://lioapp.lrc.gov.on.ca/edwin/EDWINCGI.exe?IHID=4933&AgencyID=1&Theme=All_Themes

VARIOUS WILDLIFE LAND INFORMATION ONTARIO DATA LAYERS

arious LIO data layers (e.g., Wintering Area, Travel Corridor – Wildlife) may contain wildlife habitat information. lany of these data layers were created to support forest management and do not explicitly identify significant ildlife habitat for the purposes of the PPS. Depending on location and species type, the data may be used as nformation to help screen for potential significant wildlife habitat. Planning authorities are cautioned against sing the data to directly delineate significant wildlife habitat that may need to be identified at the site level when development is proposed and the need to identify significant wildlife habitat is triggered.

eospatial data available through LIO: http://www.ontario.ca/LIO

WATER LINE SEGMENT DATA LAYER

he Water Line Segment data layer provides line feature information for stream courses that are permanent or ntermittent that can be used as baseline data for natural heritage system identification.

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

WATER LINE SEGMENT DATA LAYER

o evaluate certain aspects of the recommended criteria for ecological function
ion, linkages).

o evaluate certain aspects of the recommended criteria for geomorphological features
groundwater functions, linkages).

o evaluate certain aspects of fish habitat at the broad scale (e.g., lakes, ponds).

ailable through LIO: http://www.ontario.ca/LIO
on this data layer is available through LIO metadata:
v.on.ca/edwin/EDWINCGI.exe?IHID=4927&AgencyID=1&Theme=All_Themes

WATER POLY SEGMENT DATA LAYER

gment data layer provides polygon feature information for water areas that are permanent or
ed that can be used as baseline data for natural heritage system identification.

o evaluate certain aspects of the recommended criteria for ecological function
ion, linkages).

o evaluate certain aspects of the recommended criteria for geomorphological features
groundwater functions, linkages).

o evaluate certain aspects of fish habitat at the broad scale (e.g., lakes, ponds).

ailable through LIO: http://www.ontario.ca/LIO
on this data layer is available through LIO metadata:
v.on.ca/edwin/EDWINCGI.exe?IHID=4928&AgencyID=1&Theme=All_Themes

TER VIRTUAL FLOW – SEAMLESS PROVINCIAL DATA LAYER

Flow – Seamless Provincial data layer provides a fully connected, flow-directed stream network
ological flow structure that can be used as baseline data for natural heritage system

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

FLOW – SEAMLESS PROVINCIAL DATA LAYER

aspects of the recommended criteria for ecological function (e.g., water

aspects of the recommended criteria for geomorphological features
ions, linkages).

aspects of fish habitat at the broad scale (e.g., lakes, ponds).

D: http://www.ontario.ca/LIO
available through LIO metadata:
WINCGI.exe?IHID=2057&AgencyID=1&Theme=All_Themes

WETLAND UNIT DATA LAYER

comprehensive geospatial information source for wetlands evaluated using
hould be used as baseline data for natural heritage system identification.

evaluated wetlands, the data layer identifies whether a wetland has been
significant and provides available evaluation scoring information.

valuated wetlands data current, MNR wetland evaluation work is ongoing,
y be available from MNR district offices. Planning authorities should address
to their local MNR district office.

sources (e.g., conservation authorities, Ducks Unlimited Canada) contain
tlands. Such data, while often contributing to a wetland evaluation, cannot
the purposes of the PPS. However, planning authorities may use the
ge purposes, including characterizing the extent of wetlands in their
d use planning initiatives (e.g., Greenbelt Plan).

mended criteria for certain aspects of ecological function (e.g., linkages,

evaluate wetlands involve wildlife features and habitat that may be useful in
These scored criteria include colonial waterbirds, winter cover for wildlife,
s, and migratory bird stopover areas. To access the detailed wetland
orities should contact their local MNR district planner.

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

IT DATA LAYER

anning authorities or proponents can refer to for identifying
information, planning authorities should contact their local

ario.ca/LIO

ailable through LIO metadata:
D=300&AgencyID=1&Theme=All_Themes

es is available through LIO metadata:
D=2141&AgencyID=1&Theme=All_Themes

les to the Wetland Unit data spatial features is available
a/View.asp?Document_ID=9006&Attachment_ID=16922

EA DATA LAYER

ed areas mapped to OBM mapping standards for
on and subtypes in Ecoregions 6E and 7E.

r size and certain aspects of ecological function

r certain aspects of ecological function

ndidate significant wildlife habitat.

ario.ca/LIO

ble through LIO metadata:
D=2526&AgencyID=1&Theme=All_Themes

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

SOME POSSIBLE MITIGATION MEASURES
• maintain as much riparian vegetation as possible to maximize shading • plant appropriate native species (of local stock if possible)
• maintain or restore as much riparian vegetation as possible to provide a food supply
• maintain or restore riparian vegetation; develop and implement an erosion and sediment control plan before removing vegetation; stabilize banks where necessary

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table C-1 (*continued from previous page*)

DEVELOPMENT ACTIVITY	POTENTIAL PHYSICAL IMPACTS	POTENTIAL IMPACTS ON FUNCTIONS AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
SITE PREPARATION AND SERVICING			
1. Vegetation removal **a. Clearing/ grubbing of shoreline/riparian areas**	• reduced stability of sensitive landforms; increased erosion of landforms	• loss of all or part of earth science feature, valleyland, etc.	• avoid removing vegetation on sensitive landforms
	• loss or disturbance of riparian wildlife species	• reduced cover and food supply for species such as otter, mink, beaver and wintering deer; loss of habitat for species requiring both aquatic and terrestrial areas; interruption of riparian corridors	• maintain or restore riparian vegetation and adjacent forests where they exist • maintain important wildlife areas (e.g., cover, nesting habitat, movement corridors)
1. Vegetation removal **b. Clearing/ grubbing of wetland areas**	• increased erosion, sedimentation and turbidity; decreased shade, cover and diversity of vegetation	• decreased photosynthesis, loss of productivity, loss of fish habitat, loss of food organisms, and avoidance of areas by fish; changes in fish species composition and abundance; smothering of upland and wetland vegetation	• maintain or restore vegetative buffers; develop and implement an erosion and sediment control plan before removing vegetation
	• see relevant potential impacts for upland areas below		

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

nued from previous page)

ENT Y	POTENTIAL PHYSICAL IMPACTS	POTENTIAL IMPACTS ON FUNCTIONS AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
	SITE PREPARATION AND SERVICING		
tion oval ing/ g of reas	- loss of vegetation and wildlife habitat or loss of significant portions of habitat; loss of successional habitat	- direct loss of habitat (e.g., winter cover, vernal pools, nesting trees, important food sources); reduction in habitat (e.g., woodland habitat for area-sensitive birds) below a critical level; habitat fragmentation	- identify and avoid or protect critical components of wildlife habitat (e.g., winter cover, vernal pools, grasslands that support indicator species, hibernation sites, migration staging areas, nesting trees) - leave a buffer around significant features and habitats of significant species
		- greater exposure of wildlife to predation and parasitism	- design the development to avoid or, where that is not possible, minimize loss of vegetation, particularly in edge habitats
		- increased vulnerability of the site to invasion by non-native species	- revegetate with native species after development
		- decreased biodiversity	- encourage cluster development to avoid housing adjacent to significant natural features - avoid fragmenting forests and severing linkages; consider restoration and planting projects to restore high edge-to-interior ratio

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

us page)

POTENTIAL HYSICAL IMPACTS	POTENTIAL IMPACTS ON FUNCTIONS AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
SITE PREPARATION AND SERVICING		
f natural linkages and ors for animal movement	• isolation of species; loss of biodiversity	• leave a buffer around habitats of significant species; identify important animal movement corridors; avoid eliminating corridors
bance of wildlife species	• disturbance of concentrations of wildlife (e.g., deer yards, bird nesting colonies) due to noise produced by clearing activities or other human activities	• time activities to avoid wildlife disturbance; leave a buffer area around sensitive species
f rare plant species and nunities	• loss of species, specialized habitats and overall biodiversity	• avoid disturbing habitats of rare plant species and communities; establish appropriate buffers
ced stability of landforms oosed of unconsolidated rial (e.g., eskers, moraines, s)	• reduced integrity of landform and loss of significance, or loss of earth science ANSI	• minimize vegetation removal on slopes; do not allow roads, skidder tracks or aggregate pits
ased erosion, sedimentation urbidity; increased inputs of ents and contaminants to rbodies and wetlands; ased soil compaction	• decreased photosynthesis, loss of productivity, loss of fish habitat, loss of food organisms, and avoidance of areas by fish; lethal or sublethal toxic effects on aquatic life; changes in fish species composition and abundance; changes in wetland plant communities	• maintain or restore vegetative buffers; develop and implement an erosion and sediment control plan; control access and movement of equipment and people; designate areas for equipment storage; time activities to avoid sensitive periods of habitat use (e.g., spawning); minimize the area and duration of soil exposure • schedule grading to avoid times of high runoff volumes (spring and fall)

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

TS	POTENTIAL IMPACTS ON FUNCTIONS AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
SITE PREPARATION AND SERVICING		
age, streams, sed or	• loss of fish habitat (e.g., water, spawning areas) and food organisms; changes in fish species composition and abundance; changes in wetland plant communities; channel erosion and changes in geomorphology	• minimize changes in land contours and natural drainage; maintain streams (permanent and intermittent) and timing and quantity of flows • ensure grades are matched at the limit of the natural feature or area or the limit of any buffer area
tree cover n of	• loss of important wildlife species or habitat	• minimize vegetation removal and changes in land contours and natural drainage; develop a tree conservation plan to encourage retention of trees where possible
articularly	• disturbance of wildlife, particularly sensitive species	• identify sensitive species before beginning the work; design grading to avoid disturbing sensitive species; conduct work at a time that is least disturbing to sensitive species
of s (e.g., es)	• loss of an earth science ANSI, valleyland, etc.	• avoid grading areas containing significant landform features

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

OTENTIAL IMPACTS ON NCTIONS AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
ION AND SERVICING	
eration to subsurface flow regime	• minimize impacts of extraction in sensitive headwater areas by ensuring progressive rehabilitation is implemented. Mitigation may be in the form of a rehabilitation plan that enhances the wetland features of the surrounding landscape or provides enhanced habitat features for threatened or endangered species either in or adjacent to the disturbed area.
creased photosynthesis, loss of oductivity, loss of fish habitat, loss food organisms, and avoidance areas by fish; lethal or sublethal ic effects on aquatic life; changes ish species composition and undance; changes in wetland nt communities	• maintain a minimum 30 m buffer from waterbodies and enhance vegetative buffers where deficient; ensure that the site plan contains an erosion and sediment control plan if the development is adjacent to waterbodies; ensure that the site plan designates an area for equipment storage; time activities to avoid sensitive periods of habitat use (e.g., spawning)
s of fish habitat (e.g., water, awning areas) and food ganisms; changes in fish species mposition and abundance; anges in wetland plant mmunities; channel erosion and anges in geomorphology anges to the hydroperiod of phibian breeding pools	• encourage rehabilitation plans that replace and/or enhance stream flow; include wetland restoration or development as mitigation for the initial disturbance; encourage the reintroduction of native wetland flora and fish species

(*continued on next page*)

---

vince not designated under the Aggregate Resources Act or where extraction may be under the Aggregate Resources Act, mineral aggregate extraction must take place in nditions and site plan provisions

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Ontario

L IMPACTS ON AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
SERVICING	
eflow in streams; loss er inputs to wetlands	• ensure that the water balance to wetlands within the zone of influence is understood; protect or replace groundwater inputs
tant wildlife species or	• ensure that topsoil is conserved for reapplication during the rehabilitation phase • provide for opportunities, based on local natural heritage strategies, to enhance wildlife habitat
bers of species or f a species	• use a natural environment report to identify sensitive species • ensure that the site development plan provides for rehabilitation strategies to replace or create new species habitat, in accordance with research results, as a mitigation measure • encourage the development of rehabilitation plans that maximize the diversity of species habitat created after extraction • encourage the designing of the extraction phases and operation timing to avoid or minimize disturbance of sensitive species

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

SOME POSSIBLE MITIGATION MEASURES
• maintain vegetative buffers; develop and implement an erosion and sediment control plan; time activities to avoid sensitive periods of habitat use; re-establish vegetation as soon as possible
• install a temporary storage basin to allow water to infiltrate, or use permanent storm management facilities
• identify sensitive species before beginning the work; conduct work at a time that is least disturbing to sensitive species
• identify and avoid significant earth science features when planning and installing services • minimize the amount of disturbance
• conduct appropriate studies to determine how to maintain the existing hydrological regime; design underground facilities (e.g., seepage collars, trenches) to minimize impacts on groundwater flows and baseflows
• avoid forest fragmentation; if services must go through forests, route the corridor through edges instead of the interior

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Table C-1 (*continued from previous page*)

DEVELOPMENT ACTIVITY	POTENTIAL PHYSICAL IMPACTS	POTENTIAL IMPACTS ON FUNCTIONS AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
		CONSTRUCTION	
1. Building construction (including accessory uses and amenities)	• increased erosion, sedimentation and turbidity; increased inputs of nutrients to waterbodies and wetlands	• decreased photosynthesis, changes in productivity, loss of fish habitat, loss of food organisms, and avoidance of areas by fish; changes in fish species composition and abundance; loss of stream channel stability; changes in plant communities	• maintain or restore vegetative buffers; control erosion, sedimentation and nutrient inputs through use of best management practices
	• water contamination by oils, gasoline, grease and other materials	• lethal or sublethal toxic effects on aquatic life and vegetation	• control water contamination through good housekeeping practices
	• increase in impervious surfaces; increased surface runoff and reduced infiltration and groundwater discharge; reduced stream baseflows and upwelling; loss of vegetation resulting in increased water temperatures	• loss of fish habitat (e.g., water, spawning areas for brook trout); changes in fish species composition and abundance; changes in wetland vegetation communities; drying of wetlands	• maintain or provide vegetative buffers; control quantity and quality of stormwater discharge using best management practices; implement infiltration techniques to the maximum extent possible
	• loss of vegetation, especially at forested edges, due to homeowners' requests that edge vegetation and dead trees be removed • barriers to animal and plant movement	• loss or fragmentation of wildlife habitat; loss of biodiversity • introduction of non-native species of plants and wildlife; increased predation and parasitism on native wildlife • interruption of functional connections	• maintain a sufficient buffer between buildings and significant features such that trees do not present a hazard to buildings; restrict access and buffer natural areas so homeowners are discouraged from dumping and improper use; provide homeowners' manual to encourage stewardship; cluster housing as much as possible to avoid habitat fragmentation; ensure a threshold level of habitat is maintained for sensitive wildlife species (e.g., area-sensitive species) • ensure that important animal movement corridors are not lost; develop alternative corridors, cover, etc. where possible

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

nued from previous page)

ENT Y	POTENTIAL PHYSICAL IMPACTS	POTENTIAL IMPACTS ON FUNCTIONS AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
		CONSTRUCTION	
ding tion ding uses ties)	• disturbance of wildlife • loss of wildlife (e.g., mortality due to collisions with buildings)	• avoidance of the area by wildlife species • gradual attrition of certain wildlife populations	• identify species sensitive to disturbance and time construction to avoid periods of habitat use • design buildings appropriately to prevent/ minimize mortality
ater ings	• realignment of stream channels; changes in water velocity	• barriers to fish movement; downstream erosion or sediment deposition; separation of stream from floodplain	• maintain existing stream channel if possible, or realign using natural channel design (accompanied by replanting plan using native vegetation); use bridges to span stream; time construction to avoid sensitive periods of habitat use (e.g., spawning)
	• increased erosion, sedimentation and turbidity	• decreased photosynthesis, changes in productivity, loss of fish habitat, loss of food organisms, and avoidance of areas by fish; changes in fish species composition and abundance; changes in wetland vegetation	• minimize width of right-of-way; develop and implement an erosion and sediment control plan; revegetate as soon as possible
	• loss of riparian vegetation	• loss of habitat for certain wildlife species (e.g., loons, ducks, reptiles and amphibians); increased water temperatures exceeding the tolerance of coldwater and coolwater fish species	• minimize width of right-of-way; time construction to avoid sensitive periods of habitat use (e.g., nesting, spawning); re-plant vegetation

(continued on next page)

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

ous page)

OTENTIAL SICAL IMPACTS	POTENTIAL IMPACTS ON FUNCTIONS AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
	CONSTRUCTION	
ruction of lateral s in wetlands	• significant alterations in wetland vegetation communities; potential change of wetland type; changes in wildlife populations	• install adequate culverts and gravel base to maintain flow of surfacewater and shallow groundwater
ruption of linkage g a watercourse	• increased roadkill as animals cross roads to follow a watercourse	• identify wildlife use of linkage and size passage under road accordingly (information on cryptic species that use linkage will probably not be obtainable, so knowledge of wildlife most likely to be present must be used)
ction of nesting es and other wildlife adsides and roads	• roadkill	• build roadside wings to keep turtles off roads; build underpasses with funnel fencing to direct turtles and other wildlife; develop alternative egg-laying sites
utants from roads	• introduction of heavy metals, oils and grease from vehicles • increased levels of salt from de-icing	• collect and treat road runoff in stormwater management facilities • use vegetated swales to capture pollutants
iers to wildlife ement	• interrupted wildlife movement along watercourse	• extend bridges beyond watercourse shorelines to allow wildlife passage

(*continued on next page*)

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

POTENTIAL IMPACTS ON FUNCTIONS AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
CONSTRUCTION	
• loss of fish habitat (e.g., water upwelling/spawning areas for brook trout); changes in fish species composition and abundance; changes in wetland vegetation communities • loss of fish habitat; lethal or sublethal toxic effects on aquatic life; changes in wetland vegetation communities and productivity • loss of coldwater and coolwater fish species where water temperatures exceed their tolerances	• minimize area of paved surfaces; design roads without curbs, gutters and sidewalks to promote infiltration; promote infiltration galleries and other infiltration devices; maintain or provide vegetative buffers; control quantity and quality of stormwater using best management practices
• avoidance of the area by wildlife species • loss or fragmentation of wildlife habitat; loss of biodiversity • introduction of non-native species of plants and wildlife • interruption of functional connections	• identify species sensitive to disturbance and time paving to avoid periods of nearby habitat use • use appropriate design to prevent/minimize mortality • ensure that important animal movement corridors are not lost; develop alternative corridors, cover, etc. where possible

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

AL IMPACTS ON S AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
STRUCTION	
f paved surfaces by mammals ty where paved ersect with movement	avoid intersecting most likely wildlife migration routes wherever possible; funnel wildlife through culverts provide overpasses for large wildlife species provide low barrier fencing or vertical walls to prevent amphibians from getting onto roadways (and to guide them to the wildlife passage culverts) provide dry wildlife passage culverts under the roadway slow traffic with traffic-calming measures
ATED WITH DEVELOPMENT	
abitat (e.g., water, eas for brook trout); ish species n and abundance; vetland hydrology and communities ture-sensitive communities and depend on them water quality due to on capabilities m environment	control rate and timing of water pumping; control lawn watering; pump from deep wells to infiltration galleries adjacent to waterbodies or wetlands restrict taking of groundwater and surfacewater during periods of extremely low flow

(*continued on next page*)

Quick Links

Table of Contents ii

Abbreviations Used in This Manual xi

Provincial Policy Statement Implementation 6

Natural Heritage Systems 15

Natural Heritage Features and Areas 37

Significant Habitat of Endangered and Threatened Species 47

Significant Wetlands and Significant Coastal Wetlands 56

Significant Woodlands 63

Significant Valleylands 74

Significant Wildlife Habitat 81

Significant Areas of Natural and Scientific Interest 90

Fish Habitat 94

How to Protect: Municipal Planning Techniques and Tools 107

Addressing Impacts of Development and Site Alteration 118

Provincial Land Use Planning Documents 134

Natural Heritage System Planning 145

Natural Heritage Information Sources 166

Glossary 216

Works Cited 219

ON URES	SOME POSSIBLE MITIGATION MEASURES
VELOPMENT	
uced lake nal	• make alternative servicing arrangements or use alternative nutrient removal technologies approved by MOE
e; tion ity; shift nblage s of	
on or	• avoid installing system near sensitive vegetation or landforms
eased oxygen xic vildlife species t	• avoid use of fertilizers and other chemicals in shoreline or riparian areas; maintain or provide vegetative buffers; provide homeowners' manual to promote stewardship
d species ce; loss	• minimize erosion by using gravel, stones or wood on paths and installing fencing or other deterrents to humans; provide clearly marked trails that route people away from sensitive features; restrict access to designated trail access points; provide patrols or forum for residents to keep watch and report on use of natural areas; enforce "no dumping" rules and proper trail use

(*continued on next page*)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

SOME POSSIBLE MITIGATION MEASURES
cluster housing so people are concentrated and less habitat is disturbed; provide more education to promote stewardship; restrict access to natural areas to suitable trails
promote public education/awareness, which may help over the long term; recommend leash laws for dogs
choose designs (e.g., floating docks) and materials that will minimize impacts; avoid sensitive areas of shoreline
develop trails for walking and bicycling that direct people away from sensitive habitats; provide forum for people to keep watch on natural areas and report on improper use; enforce proper trail use; provide suitable off-leash areas for dogs and enforce leash laws in sensitive areas

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

le C-1 *(continued from previous page)*

EVELOPMENT ACTIVITY	POTENTIAL PHYSICAL IMPACTS	POTENTIAL IMPACTS ON FUNCTIONS AND FEATURES	SOME POSSIBLE MITIGATION MEASURES
ACTIVITIES ASSOCIATED WITH DEVELOPMENT			
4. Recreation (e.g., walking, swimming, boating, fishing, hunting, use of all-terrain vehicles and snowmobiles)	• disturbance of wildlife, especially during critical periods	• loss of wildlife species and reduced numbers of wildlife	• restrict some areas for ATVs and snowmobiles; provide education
	• attraction of some wildlife species due to human activities (e.g., bird feeding); attraction of scavengers (e.g., bears, raccoons)	• increased numbers of some species; increase in nuisance species (e.g., squirrels)	• educate the public about attracting nuisance species; provide appropriate garbage receptacles and service
	• reduced opportunities for hunting and trapping in developed areas; increase in injury and mortality of deer due to vehicle accidents	• increase in nuisance species (e.g., racoons, deer)	• set aside hunting reserves where hunting can take place safely
	• increased harvest of fish	• reduced numbers of fish	• comply with fishing regulations; exercise stewardship
	• trampling of sensitive life science or earth science features (e.g., sand dunes)	• loss of all or part of a sensitive feature or area	• locate development away from sensitive feature or area
	• access to sensitive sites (fossil and mineral localities)	• site stress from vandalism; loss of integrity	• route recreation away from feature; provide opportunities for people to report on natural areas; enforce proper trail use

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

ing Buffers

strating that there will be no negative impacts on the r their ecological functions within adjacent lands, entified once the nature of the development is known potential impacts can be determined.

Table C-2 below describes how buffers for PPS natural heritage features should be applied. In certain circumstances, the adjacent lands width will need to be expanded beyond the recommendations provided in this manual; in such cases, those expanded adjacent lands widths will require a buffer to cover the entire area (see section 4.5).

atural Heritage Features and Buffer Descriptions

L E E	BUFFER DESCRIPTION
abitat d and pecies	Buffer requirements for the habitat of threatened and endangered species vary according to the species. For example, the ORMCP and the Greenbelt Plan require that buffers for the habitat of endangered and threatened species be considered on a case-by-case basis through a natural heritage evaluation, depending on the requirements of the species. For both plans, additional buffer width may be required subject to the findings of natural heritage evaluations undertaken. This represents a function-based approach to delineating a buffer and is recommended for the entire province.
ficant ls and oastal tlands	Wetland buffers can be critical for protection of wetland areas. Recommended widths may vary depending on the functions of the wetland and proposed adjacent land uses. The PPS provides specific protection for wetland features, which are defined using the provincial wetland evaluation procedures,[68] but it does not provide any policy direction on the delineation or protection through use of buffers. However, many functions associated with wetlands involve lands adjacent to wetlands. Thus, in order to be consistent with PPS policy 2.1.6, which does not permit development or site alteration unless it can be determined that there will be no negative impacts on wetland features or functions, an evaluation of adjacent lands is required with appropriate mitigation; for example, the delineation of buffers must be undertaken. Buffers must be determined and rationalized on the basis of their ability to protect the wetland feature and its associated functions. Buffer requirements are changing as the impacts of adjacent development become better understood through wetland ecology research. Thus, current literature must be consulted to review the potential impacts relevant to the wetland under consideration.

(continued on next page)

---

or boundary delineation provided in the OWES manuals are to be used to determine wetland boundaries for the purposes of being consistent with LC protocols for wetland classification are based on a similar approach, but the OWES manuals are to be followed for PPS purposes.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

us page)

BUFFER DESCRIPTION

vidths as little as 10 m or as great as several hundred metres may be necessary to protect various functions (adjacent ould have to be expanded to address potential negative impacts prior to identifying a buffer). For example, buffer of as little as 10 m have been shown to be effective for the attenuation of nitrates and phosphorus in runoff, as long ouffer ground surface is relatively flat and composed of dense vegetation that can filter and attenuate runoff. ements for buffers could be much more extensive for protection of some functions. For example, a wetland at the n of a steep slope is highly vulnerable to silt deposition (which can increase turbidity and smother plants and bian eggs) if the soils on the slope are graded and if silt controls are not sufficient to deal with the volumes of water ode silt from the slope. In this case, 10 m may not be an adequate buffer. Adjacent to a mature forested wetland, calculated on tree height can allow for trees at the edge of the wetland to fall without damaging adjacent structures ction 7.4). Thus, demand is less for removal of dying trees from the wetland edge, as is the consequent degradation.

would typically be in the order of 30 m in width to protect the edge function of the trees. Buffers could be eds of metres wide to provide nesting habitat of certain bird species such as the blue-winged teal, because these s need cover through which to lead their brood from the nest site to the wetland.

are recommended around woodlands to protect the structural integrity of vegetation along the edge, as well as to ze impacts on woodland functions. It has been found that if a minimum buffer is not specified, the result is often no at all. The appropriate buffer may vary with the location, character of the woodland and the nature of proposed nt uses. Some of the services that buffers may provide include:

otection of root zone of edge trees;
duction in the effects of hydrological changes from site alterations;
ea where trees and limbs can fall without causing damage (tree fall zones);
ering of contaminants such as nutrients from lawn fertilizers;
tension of edge, thus increasing potential for woodland interior conditions to develop; and
otection for wildlife use.

ample, the ORMCP and the Greenbelt Plan require a minimum 30 m buffer (vegetation protection zone) around cant woodlands. For both plans, additional buffer width may be required subject to the findings of natural heritage tions undertaken where development or site alteration is proposed within 120 m of the woodland edge.

absence of other natural heritage features such as woodlands and wetlands, buffers for valleylands should be based ieving a stable top of bank. Most conservation authorities have policies for establishing the buffer required from o of bank of a valley for achieving this. For example, applications within the ORMCP require a minimum 30 m buffer table top of bank, and the need for additional buffer must be determined through a site-specific study where pment or site alteration is proposed within 120 m of significant valleylands. In some cases, a geotechnical study e required. Where other natural heritage features are associated with a valleyland feature, the appropriate section manual should be consulted for guidance on appropriate buffer widths.

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

BUFFER DESCRIPTION

ife habitat should be determined on a case-by-case basis, depending on the features of the
Buffers should also be based on the nature of the development proposed, as some
eater capacity to affect certain habitats. Also applicable is the Significant Wildlife Habitat
(see appendix B.1.2), a simple computer-based tool that describes the wildlife habitat,
opment impacts that may affect the habitat and provides mitigation measures for a proponent
g in or adjacent to a significant wildlife habitat. The buffer area should represent a protective
and the development. The study that determines the area of adjacent lands should be used as
the appropriate buffer width.

n relation to other significant natural heritage features found within an ANSI, such as wetlands

ea intended to act as a transition between the limit of development and the area of fish habitat
fer minimizes the potential for a change in land use to compromise the habitat. Thus the buffer
sh habitat and any proposed development. For ecological reasons, this area must be naturally
vide additional protection to the fish habitat area and thus be of relevance in demonstrating no
sults of impact assessments may indicate the need to maintain additional vegetated areas on all
nds. The width of buffer strips will vary depending on the potential risk to fish habitat and the
n of a stream and its corridor or a lake in the watershed. For example, a larger buffer area may
EIS in areas where the potential risk to fish habitat is relatively high due to steep slopes and
o protect the habitat of endangered and threatened fish species. Buffer width will depend on
s and the sensitivity of the features to be protected. For example, streams providing habitat
nsitivity where the proposed change in land use is minor may require buffers of only 15 m,
(that is not at capacity) adjacent to intensive development may require up to 120 m of buffer.
h is recommended for streams that have not been characterized, since many contain sensitive

as been determined to be at capacity, the buffer for new development should be 300 m, as is
nmended adjacent lands study area (see section 11.4) and application of the model described in
Assessment Handbook (see section 15).

ivities (e.g., taking of groundwater), unless adequately controlled, can cause negative impacts
erably more than 120 m away from fish habitat. Consequently, controls may be needed with
f groundwater, changes in water infiltration, and stormwater discharge wherever they occur in
PS policies 2.2 for water).

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

The text below provides an overview of information sources and possible techniques for describing the existing environment by addressing the following topics: terrain setting, hydrology, fluvial geomorphology and biological resources.

Existing information such as Ontario Geological Survey maps, including surficial geology and landform maps, hydrogeological maps and reports, water well records, topographic maps and OBMs, soils maps, floodplain maps, fish habitat maps, aerial photographs, Forest Resource Inventory (FRI) maps, earth science ANSI reports and wetland evaluation data records can be used to describe the terrain setting. Chapman and Putnam (1984) provide a comprehensive reference for glacial processes and their relationship to landforms in southern Ontario.

2. Field Techniques for Refining Information on Terrain Setting

The terrain setting will have been generally described using existing data. Some additional tasks may be appropriate for precise definition of functions. This work is most critical where it appears that surface- and groundwater pathways are related and could be affected by the proposed development. Additional work could include site-specific measurements such as additional soil sampling, refinement of aerial photograph interpretation, and installation of boreholes and groundwater monitoring. Installation of boreholes is appropriate in complex geological settings where little is known about groundwater movements or relationships between surface- and groundwater.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

eld Techniques for Obtaining Additional Hydrological mation

ater Quantity

ome site assessments, it may be necessary to obtain long-term -quantity data; this component of the study may have to be ed earlier than others. Where water quantity is an issue, water-level es can be established.Some areas may already have established es that could be useful. The purpose of gauges is to determine onal water-level fluctuations. The number of gauges required nds on the number of tributaries involved and the location and e of the proposed development. Gauges may serve as post- lopment monitoring stations.

requency and duration of water-level monitoring will depend on the al heritage features and areas potentially affected by development. g an understanding of hydrological processes in and adjacent to nds and fish habitat is critical but may not be important in some icant woodlands and wildlife habitat. Observations are usually e at least during spring and summer to understand the hydroperiod, n includes the duration, frequency, depth, extent and season of ing. Data loggers relieve the researcher from the intensity of labour led in water-level monitoring.

etermining the Contribution of Water and Water Balance

n water flowing into a natural heritage area originates from more one subcatchment. It may be necessary to determine the relative ibution of each basin to the area, as well as the contribution from ndwater. This involves having an understanding of soils, land use opography.

ter balance is used to determine changes in hydrological ways due to development. Data on precipitation, temperature and ght hours, as well as data on soil permeability, is used to determine nnual evaporation loss and annual surplus (runoff plus infiltration). n the high variability of temperature and precipitation rates in rio, the water balance is usually calculated monthly. Calculation of ter balance is usually necessary only where determining the ntial impacts of development on key functions is essential.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

pling is a good method for evaluating water-
nitors conditions at only one point in time.
e excellent indicators of water quality because
ages in aquatic habitat. In some instances,
pulations may be used to determine water
ng approaches using indices that are based on
n of benthic organisms have been developed to
ater quality and habitat quality, including the

integrity for quantifying stream quality in
(Steedman, 1988)

ada's Canadian Aquatic Biomonitoring
dson et al., 2003)

Bioassessment Protocol (David et al., 1998)

Biomonitoring Network protocols (Jones et al.,

e.g., bogs, fens) are sensitive to subtle shifts in
More intensive water-quality sampling
sary for proposals relating to development that
d types.

uality processes demands a determination of
entrations but also chemical loadings. This
of the quality and quantity information and is
onducting a mass balance.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

C. Fluvial Geomorphology

he geology of an area dictates the nature of a stream – its gradient, ubstrate, fertility and productivity – as well as the form of the valley and s channel. Fluvial geomorphology is the study of the interactions etween the geological components of a stream and how land use hanges influence them. The volume of water in a watercourse is the rimary factor in shaping its channel. Streams are in dynamic quilibrium, subject to bankfull conditions that reshape the channel and ow-flow conditions that readjust the channel. In natural landscapes, vatercourses maintain the shape and form of channel that is most fficient to move and store water and sediments in all flow conditions.

The processes occurring within a watercourse are highly affected by land use. Changes in land use that affect peak flows and/or baseflows in streams are highly likely to change the configuration of channels and subsequently the quality of fish habitat.

Rosgen (1996) described a standard method for characterizing the fluvial geomorphology of watercourses. For developments that may affect peak flows or baseflows in watercourses or the amount of sediment delivery, completing this type of watercourse characterization may be necessary.

D. Biological Resources

. Describing Biological Resources Using Existing Information

otential information sources for describing biological resources are rovided in appendix B.

Jsing existing information, a habitat map may be prepared that shows atural heritage areas and features, vegetation communities and djacent lands.

errestrial habitats can be characterized by known relationships between vildlife species and habitat requirements. These characteristics can be napped at a variety of scales, ranging from satellite imagery to very ite-specific scales.

2. Field Techniques for Describing Biological Resources

Detail required to characterize biological resources will vary considerably depending on the complexity of the site and the nature of the development. This section describes a number of techniques for inderstanding key functions.

For simplicity, biological characteristics are described in the context of either terrestrial habitats or fish habitats and other aquatic habitats. These systems, however, overlap and are dynamic. Some understanding of the successional dynamics of the habitat is necessary to interpret biological processes.

Biological features are dependent on hydrology and the terrain setting. A change in hydrology is likely to alter vegetation communities and the wildlife species that inhabit an area.

a. Terrestrial Habitat

Terrestrial habitat may include significant wetlands, significant habitat of endangered and threatened species, woodlands, valleylands, significant wildlife habitat and ANSIs. Wetlands may include terrestrial, aquatic and fish habitat. Most adjacent lands will be terrestrial habitats and can include old fields, forests, developed areas and agricultural lands.

Interfaces among natural habitats occur over a continuum as a result of gradual and often subtle changes in soil texture and moisture, microclimate and topography. Functions of adjacent natural habitats may be closely related and dependent on each other. In addition, terrestrial habitats may change gradually or abruptly into aquatic habitat.

The interface between natural and human-altered habitats is often abrupt, and distinguishing where one habitat stops and another begins is usually easy to do. This does not mean that these habitats are functionally isolated. For instance, hawks nesting in wetlands, woodlands or valleylands may feed in agricultural lands or old fields; waterfowl that feed and court in wetlands may nest in adjacent old fields.

Terrestrial habitats are usually characterized by mapping vegetation communities and habitat features and taking inventories of the flora and fauna present. Habitat characterization can be initiated with materials such as aerial photographs, FRI and topographic maps, and OBMs. Confirmation of habitat characteristics within the study area may involve fieldwork.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

rrestrial habitats leads to a better understanding of within and outside natural heritage areas (e.g., wildlife dors), contributes to an understanding of past dentifies potential habitat improvements through d elimination of limiting factors.

for southern Ontario and the FEC available for much of and northern Ontario provide standardized habitat e ELC for southern Ontario (Lee et al., 1998) also ures for mapping and field data collection. For highly ts in the south that are not identified in the ELC, he general habitat and dominant species (e.g., t) can be provided. Verifying vegetation conditions in he growing season is recommended. For areas in 5E, other FEC manuals apply.

etation sampling methods such as quadrant analysis, centred quarter analyses and standard FRI techniques be necessary to precisely characterize habitat and to e impacts. However, depending on the level of detail ssessment plots are often used to good effect in the w more data to be gathered in a short time.

habitat mapping is usually prepared for endangered or es. A map depicting habitat use during various parts nproves the understanding of potential development cies.

b. Terrestrial Species Inventory

Some of the more commonly used techniques for conducting inventories of terrestrial flora and fauna are described in table C-3. Additional information on terrestrial species inventory is available in Wildlife Monitoring and Inventory Techniques for Ontario (Konze and McLaren, 1997). An important consideration is that species inventory information needs to be collected in the appropriate seasons.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

entory Components

DESCRIPTION

an inventory of plant species on a site is recommended when assessing potential development impacts. Two or sits are usually made to cover the entire flowering season. Habitat quality can be determined using indices such percentage of native species, coefficients of conservatism and the weediness index. These indices are available Floristic Quality Assessment System for Southern Ontario (Oldham et al., 1995). By compiling a plant species list tural area and looking up the coefficients of conservatism for each species listed, an FQI can be calculated, which used to compare the quality of natural areas. The NHIC (see appendix B.1.2) has produced a list of native plants ng in southern Ontario and has assigned tentative coefficients of conservatism to each.

cally, invertebrates are an important group of wildlife. There are more species and individuals of invertebrates y have a greater biomass than any other wildlife group. They are the basis of the wildlife food chain and also e a high percentage of plant species. Invertebrates play a major role in decomposition and nutrient recycling. an be indicators of highly specific habitat variables.

e their importance, little is known about the ecology of most invertebrates, and keys for identifying many of them dequate. Therefore, a general inventory of invertebrates is not usually suggested for assessing development s.

e exceptions are butterflies and odonates (dragonflies and damselflies). These invertebrates are relatively easy to and considerable information is available on their ecology. However, even odonate inventories may be vely time-consuming. A relatively complete inventory usually requires multiple visits from early spring to late n to cover the flight periods of all potential species. Butterflies also wander considerably, so determining whether es is a resident or a vagrant may be difficult.

erfly and odonate atlas can be consulted to determine whether any significant species have been documented in neral region and whether their preferred habitat and plant species occur in the study area. Work to observe these species during the peak of their flight period could then be initiated.

bians include frogs, toads and salamanders. Frogs and toads vocalize during the breeding season, and the ian Wildlife Service has prepared a standard protocol and a training tape for monitoring these amphibians. In ng potential development impacts on these species, additional information such as numbers and locations of asses and whether tadpoles transformed successfully may be useful.

anders are more difficult to inventory. They spend much of their lives in rotten logs, underground or in water. is critical for finding many of these species. The mole salamander species are best inventoried by looking for just after snowmelt, or by looking for egg masses or larval young in woodland pools before the end of June. species must be sought under rotting logs, in seeps along the base of cliffs or under streamside rocks. anders are important ecologically. In many woodlands, they represent the highest vertebrate biomass and are to the food chain. They can be indicators of habitat that is suitable for species that require high humidity levels.

(continued on next page)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

DESCRIPTION

udes turtles, snakes and skinks. Turtles, which prefer warm bodies of water and sunny
regulation, are easiest to observe in spring and autumn when sunning behaviour is more
ments can be complex, as most turtles need nesting sites that are sandy banks with
bitat, and must also be able to move between habitats in dry years.

icult to inventory and are most frequently sighted when sunning in open exposed locations, or
in suitable habitat. In the spring, snakes often remain in the vicinity of their hibernacula for a
bservations of snakes will suffice when assessing potential development impacts. However,
out a particular species, pieces of wood or metal placed on the ground (i.e., coverboards) can
In many cases, it will be necessary to use drift fencing and even more labour-intensive
tracking to obtain meaningful information on reptile species.

formation on the presence of bird species in a particular study area and their dependence on
g, foraging, roosting, migrating) be gathered. Birds are usually the most diverse wildlife group
an provide information about many subtle habitat characteristics. Data about birds can be
ral techniques such as those used by the Ontario Forest Bird Monitoring Program and the
m. All bird species seen or heard in appropriate habitat during their breeding season are
possible breeders. Birds that show signs of occupying territories, form pairs or exhibit
nesting are considered probable or confirmed breeders.

nd/or nocturnal, the only evidence of their presence being signs (e.g., scats, tracks, browse
nd other signs are sufficient to indicate the presence of mammals. Track surveys performed
ovide more information. In some cases, however, live trapping or even radio tagging may be
fferent monitoring techniques and may be monitored/inventoried using specialized equipment
tic frequencies or flight paths/direction. MNR has wildlife survey manuals for some species,
wintering areas; as well, standard techniques exist for determining deer yards.

hreatened and
upport fish may also
ch as amphibians.
ovides it to

It is recommended that proponents consult this information to determine whether habitats are coldwater, warmwater, intermittent or permanent and to determine the habitat type. MNR's detailed habitat maps are supplemented by background information, including species present and the rationale for habitat type.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

3. Elements of Site-Specific Assessments of Impacts

- understanding of hydrogeological setting, including fluvial geomorphology
- hydrological information and modelling
- water-balance exercise
- water-quality information
- habitat assessment details for terrestrial and aquatic systems
- modelling of habitat, if required
- ELC
- confirmation and detailed characterization of significant features
- characterization of linkages (terrestrial and aquatic)
- characterization of values
- characterization of impacts on key ecological functions
- mitigation strategy, net effects predictions and monitoring recommendations
- compatibility with planning area natural heritage systems, or other natural heritage strategies

4. Site-Specific Impact Assessment Map

Depending on the type of assessment and the nature of the development, site-specific impact assessment map scales can vary (e.g., 1:10,000 to 1:2,000) and could include the following information:

- title
- north arrow
- scale
- legend: date of production/revision, identity of proponent and representative
- natural heritage area and adjacent lands
- detailed drainage patterns; inflows and outflows
- presence of control structures, culverts, etc.
- water-level gauge locations
- basins and sub-basins
- soil textures

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

igation:

acility locations that use best management practices
protective barriers (temporary and permanent)
ehabilitation/enhancement measures
plantings
monitoring

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

ns that are semantically related to but are a
ech than a defined term (e.g., the verb "mitigate"
nitigative" vs. the defined noun "mitigation") can
he meaning of the defined term.

in the definition of other glossary terms are

---

area occupied by a closed drainage system,
on that collects surface runoff and contributes it to
el, lake or other body of water. Also known as a
"watershed." Divisions of this basin are known as
" or "subwatersheds."

: the condition of an ecosystem in which (a) the
osition and function are unimpaired by stresses
vity, (b) natural ecological processes are intact and
nd (c) ecosystem evolution is occurring naturally.
rity includes hydrological integrity. (Adapted from
the Oak Ridges Moraine Conservation Plan)

o referred to as "woodland" or "forest interior
r habitat is usually defined as habitat more than
the edge of the woodland. (Adapted from Askins
dOwner Resource Centre and Ontario Ministry of
es, 2000)

he most extensive and most connected landscape
esent, which plays the dominant role in landscape
apted from Forman and Godron, 1986)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

linkage/corridor: a linear area intended to provide connectivity (at the regional or site level), supporting a complete range of community and ecosystem processes, enabling plants and smaller animals to move between core areas and other larger areas of habitat over a period of generations. The terms are used interchangeably for planning purposes but may need to be distinguished for ecological or biological reasons. (Adapted from Hess and Fisher, 2001)

meander belt: the lateral containment of a river channel on a land surface. Technically, the meander belt width is quantified as the distance normal to tangential lines drawn to outside bends of the meanders within the reach of interest. (Adapted from Adaptive Management of Stream Corridors in Ontario including Natural Hazards Technical Guides – see appendix B.1.2)

mitigation: the prevention, modification or alleviation of impacts on the natural environment, and – specifically in the context of policies 2.1.4 and 2.1.6 and the definitions in the PPS – the prevention of negative impacts. Mitigation also includes any action intended to enhance beneficial effects.

normal high-water mark: the usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bankfull level" which is often the one-to two-year flood flow return level. For inland lakes, it refers to those parts of the waterbody bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water-tolerant species). For reservoirs this refers to normal high operating levels. (Adapted from Fisheries and Oceans Canada, 2009)

patch: a non-linear surface area differing in appearance from the *landscape matrix*.

precautionary approach: an approach that is designed to prevent environmental degradation where there are threats of serious or irreversible damage or lack of full scientific certainty. (adapted from Principle 15 – 1992 UNEP Rio Declaration on Environment and Development)

provincial rank: a rank, also called a "subnational" rank or "SRANK," that the NHIC uses to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned on the basis of only those factors within the political boundaries of Ontario. The status and rarity of a species and the urgency of its conservation needs can be ascertained by comparing the global and provincial ranks. NHIC evaluates Ontario species in terms of their provincial rank and produces updated lists of provincially ranked species at least annually. Provincial ranks are listed below:

- **S1 Critically Imperilled –** Critically imperilled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s), such as very steep declines, making the species especially vulnerable to extirpation from the state/province
- **S2 Imperilled –** Imperilled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines or other factors making the species very vulnerable to extirpation from the nation or state/province
- **S3 Vulnerable –** Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines or other factors making the species vulnerable to extirpation

qualified professional: a person carrying out studies or evaluations as recommended or required by the Natural Heritage Reference Manual who meets any specific requirements (e.g., wetland evaluation training) to carry out the study or evaluation and where appropriate meets professional standards in their particular field and is accredited by a professional association.

rehabilitation: restoration of the ecosystem to a higher functioning condition.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

sensitivity assessment: assessment of the degree and spatial extent of functions to determine their sensitivity to impacts from various land use activities.

Southern Ontario Coefficient of Conservatism: a numeric value between 0 and 10 assigned to each plant species indicating the degree of faithfulness a plant displays to a specific habitat or set of environmental conditions. "Conservative" plant species, such as those that are found only in relatively pristine natural habitats like bogs or prairies, are assigned a high coefficient of conservatism; other plant species that grow in a wide variety of habitats and can tolerate high levels of cultural disturbance are assigned low values. By compiling a plant species list for a natural area and looking up the coefficients of conservatism for each species listed, one can calculate a Floristic Quality Index, which can be used to compare the quality of natural areas. The NHIC has produced a list of native plants occurring in southern Ontario, and has assigned tentative coefficients of conservatism to each.

stream reach: a relatively homogeneous portion of a river that includes a consistent slope and bed materials, and at least two full meander wavelengths of channel repetition.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

WORKS CITED

Askins, R.A., and M.J. Philbrick. 1987. Effect of changes in regional forest abundance on the decline and recovery of a forest bird community. Wilson Bulletin 99:7-21.

Austen, M.J.W., C.M. Francis, D.M. Burke and M.S.W. Bradstreet. 2001. Landscape context and fragmentation effects on forest birds in Southern Ontario. Condor 103(4):701-714.

Baguette, M., and H. Van Dyck. 2007. Landscape connectivity and animal behaviour: functional grain as a key determinant for dispersal. Landscape Ecology 22:1117-1129.

Bailey, S. 2007. Increasing connectivity in fragmented landscapes: an investigation of evidence for biodiversity gain in woodlands. Forest Ecology and Management 238:7-23.

Banfield, A.W.F. 1974. The Mammals of Canada. University of Toronto Press, Toronto.

Bedford, B.L., and E.M. Preston. 1988. Cumulative effects on landscape systems of wetlands. Environmental Management (Special Issue) 12(5):561-775.

Beier, P., and R.F. Noss. 1998. Do habitat corridors provide connectivity? Conservation Biology 12(6):1241-1251.

Benedict, M.A., and E.T. McMahon. 2006. Green Infrastructure: Linking Landscapes and Communities. Island Press, Washington, D.C. Pp. 131.

Bennett, A.F. 1999. Linkages in the Landscape. The Role of Corridors and Connectivity in Wildlife Conservation. IUCN–World Conservation Union, Gland, Switzerland, and Cambridge, United Kingdom. Pp. x + 254.

Bennett, A.F., K. Henein and G. Merriam. 1994. Corridor use and the elements of corridor quality – chipmunks and fencerows in a farmland mosaic. Biological Conservation 68(2):155-165.

Bowne, D.R., M.A. Bowers and J.E. Hines. 2006. Connectivity in an agricultural landscape as reflected by interpond movements of a freshwater turtle. Conservation Biology 20(3):780-791.

Burbrink, F.T., C.A. Philips and E.J. Heske. 1998. A riparian zone in southern Illinois as a potential dispersal corridor for reptiles and amphibians. Biological Conservation 86:107-115.

Burgess, R.L., and D.M. Sharpe (eds.). 1981. Forest Island Dynamics in Man-dominated Landscapes. Springer-Verlag, New York.

Burke, D.M., and E. Nol. 1998. Edge and fragment size effects on the vegetation of deciduous forests in Ontario, Canada. Natural Areas Journal 18:45-53.

Burke, V.J., and J.W. Gibbons. 1995. Terrestrial buffer zones and wetland conservation: a case study of freshwater turtles in a Carolina bay. Conservation Biology 9(6):1365-1369. (See section 16 for further detail.)

Canadian Urban Institute and the Natural Spaces Leadership Alliance. 2006. Nature Counts: health, wealth and southern Ontario's greenspace. http://www.canurb.com/media/pdf/Nature_Counts_rschpaper_FINAL.pdf.

Carolinian Canada. 2000. Guidelines for determining setbacks and buffers. In Draft Guide for Determination of Setbacks and Buffers. Pp. 27-33. (See section 16 for further detail.)

Castelle, A.J., A.W. Johnson and C. Connolly. 1994. Wetland and stream buffer size requirements: a review. Journal of Environmental Quality 23:878-882. (See section 16 for further detail.)

Chagrin River Watershed Partners, Inc. 2006. Why Riparian Setbacks? Willoughby, Ohio. http://www.crwp.org. (See section 16 for further detail.)

Chambers, B.A., B.J. Naylor, J. Nieppola, B.J. Merchant and P.W.C. Uhlig. 1997. Field Guide for the Forest Ecosystems of Central Ontario. South Central Region Science and Technology Unit, Field Guide FG-01, Ontario Ministry of Natural Resources, North Bay, Ontario.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Chapman, L.J., and D.F. Putnam. 1984. The Physiography of Southern Ontario; Ontario Geological Survey, Special Volume 2. 270 pp. Accompanied by Map P.2715 (coloured), scale 1:600,000.

Cheskey, E.D. 1995. Towards Conserving the Birds of Ontario. Federation of Ontario Naturalists. Don Mills, Ontario. Pp. 48.

Chu, C., C.K. Minns and N.E. Mandrak. 2003. Comparative regional assessment of factors impacting freshwater fish biodiversity in Canada. Canadian Journal of Fisheries and Aquatic Sciences 60.

Cocklin, C., S. Parker and J. Hay. 1992. Notes on cumulative environmental change 1: concepts and issues. Environmental Management 35:31-49.

Commission on Planning and Development Reform in Ontario. 1993. Recommended Policy #11. Pp. 30.

Cowling, R.M., R.L. Pressey, R. M. Rouget, A.T. Lombarda. 2003. A conservation plan for a global biodiversity hotspot—the Cape Floristic Region, South Africa. Biological Conservation 112: 191-216.

Crins, W.J. 1996. Life Science Gap Analysis for Site District 4E-3. Ontario Ministry of Natural Resources, Lands and Natural Heritage Branch, Peterborough, Ontario. Pp. 251.

Cronquist, M.J., and R.P. Brooks. 1993. Effects of habitat disturbance on bird communities in riparian corridors. Journal of Soil and Water Conservation 48(1):65-70.

Cross, S.P. 1985. Responses of small mammals to forest riparian perturbations. In R.R. Johnson, C.D. Ziebell, D.R. Patten, P.F. Folliot and R.H. Hamre (eds.). Riparian Ecosystems and Their Management: Reconciling Conflicting Uses. U.S. Department of Agriculture, Forestry Service. General Technical Report RM-120. Pp. 269-275.

David, S.M., K.M. Somers, R.A. Reid, R.J. Hall and R.E. Girard. 1998. Sampling Protocols for the Rapid Bioassessment of Streams and Lakes Using Benthic Macroinvertebrates, 2nd edition. Ontario Ministry of the Environment, Dorset, Ontario.

Davies, K. 1991. Monitoring for Cumulative Environmental Effects: a review of seven environmental monitoring programs, 2nd draft edition. Prepared for the Federal Environmental Assessment Review Office and Environment Canada.

Decker, D.J., M.E. Krasny, G.R. Goff, C.R. Smith and D.W. Gross (eds.). 1991. Challenges in the Conservation of Biological Resources – a Practitioner's Guide. Westview Press, Colorado. Pp. 402.

Desbonnet, A., P. Pogue, D. Reis, J. Boyd, J. Willis and M. Imperial. 1995. Vegetated Buffers in the Coastal Zone – a Summary Review and Bibliography. Coastal Resources Center Technical Report No. 2064. University of Rhode Island Graduate School of Oceanography. Narragansett, Rhode Island. Pp. 72.

Dole, J.W. 1965. Summer movements of adult leopard frogs, Rana pipiens Schreber, in northern Michigan. Ecology 46(3):236-255.

Dunne, T., and L.B. Leopold. 1978. Water in Environmental Planning. W.H. Freeman, Ecology and Economics Research Department, San Francisco, California.

Environment Canada. 2004. How Much Habitat Is Enough: A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern, 2nd edition. Canadian Wildlife Service. Pp. 80. (See section 16 for further detail.)

Environment Canada, Ontario Ministry of Natural Resources and Ontario Ministry of the Environment. 1998. A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern. Canada–Ontario Remedial Action Plan Steering Committee. March 1998. Pp. 76.

Environmental Law Institute. 2003. Conservation Thresholds for Land Use Planners. Washington, D.C. Pp. 55. (See section 16 for further detail.)

Evans, D.O. 2007. Effects of hypoxia on scope-for-activity and power capacity of lake trout (Salvelinus namaycush). Canadian Journal of Fisheries and Aquatic Sciences 64:345-361. http://pubs.nrc-cnrc.gc.ca/rp-ps/issueDetail.jsp?jcode=cjfas&lang=eng&vol=64&is=2.

Fahrig, L. 2002. Effect of habitat fragmentation on the extinction threshold: a synthesis. Ecological Applications 12(2):346-353.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Farrar, J.L. 1995. Trees in Canada. Fitzhenry & Whiteside Ltd., Markham, Ontario.

Fischer, R.A. 2000. Width of Riparian Zones for Birds. Ecosystem Management and Restoration Research Program Technical Notes Collection (EMRRP-SI-09). U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. http://el.erdc.usace.army.mil/elpubs/pdf/si09.pdf. (See section 16 for further detail.)

Fischer, R.A., and J.C. Fischenich. 2000. Design Recommendations for Riparian Corridors and Vegetated Buffer Strips. Ecosystem Management and Restoration Research Program Technical Notes Collection (EMRRP-SR-24). U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. http://el.erdc.usace.army.mil/elpubs/pdf/sr24.pdf. (See section 16 for further detail.)

Fischer, R.A., C.O. Martin, J.T. Ratti and J. Guidice. 2001. Riparian Terminology: Confusion and Clarification. (ERDC TN-EMRRP-SR-25). U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. http://www.wes.army.mil/el/emrrp.

Fisheries and Oceans Canada. 1986. The Department of Fisheries and Oceans Policy for the Management of Fish Habitat. Fish Habitat Management Branch, Department of Fisheries and Oceans, Ottawa, Ontario. Pp. 28. http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/policies-politique/management-gestion_e.asp.

Fisheries and Oceans Canada. 2006. Practitioners Guide to the Risk Management Framework for DFO Habitat Management Staff, Version 1.0. Habitat Management Program. Pp. 26. http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/policies-politique/operating-operation/risk-risques/index_e.asp.

Fisheries and Oceans Canada. 2007. Survey of Recreational Fishing in Canada, 2005. Economic Analysis and Statistics Policy Sector, Fisheries and Oceans Canada. Ottawa, Ontario. Pp. 49. http://www.dfo-mpo.gc.ca/communic/statistics/recreational/canada/2005/index_e.htm.

Fisheries and Oceans Canada. 2009. Operational Statements: Ontario – Beach Creation for Residential Use, Version 3.0. Fish Habitat Management Branch, Department of Fisheries and Oceans, Ottawa, Ontario. http://www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/provinces-territories-territoires/on/os-eo02-eng.htm.

Fleury, A.M., and R.D. Brown. 1997. A framework for the design of wildlife conservation corridors with specific application to southwestern Ontario. Landscape and Urban Planning 37:163-186.

Forman, R.T., and M. Godron. 1986. Landscape Ecology. John Wiley, New York.

Forman, R.T.T. 1995a. Land Mosaics: The Ecology of Landscapes and Region. Cambridge University Press, United Kingdom.

Forman, R.T.T. 1995b. Some general principles of landscape and regional ecology. Landscape Ecology 10(3):133-142.

Friesen, L., M.D. Cadman and R.J. MacKay. 1999. Nesting success of neotropical migrant songbirds in a highly fragmented landscape. Conservation Biology 13(2):338-346.

Friesen, L.E., P.F.J. Eagles and R.J. MacKay. 1995. Effects of residential development on forest-dwelling neotropical migrant songbirds. Conservation Biology 9(6):1408-1414. (See section 16 for further detail.)

Gibbons, J.W. 2003. Terrestrial habitat: a vital component for herpetofauna of isolated wetlands. Wetlands 23(3):630-635.

Golet, F.C., Y. Wang, J.S. Merrow and W.R. DeRagon. 2001. Relationship between habitat and landscape features and the avian community of red maple swamps in southern Rhode Island. Wilson Bulletin 113(2):217-227.

Gomez, D.M., and R.G. Anthony. 1996. Amphibian and reptile abundance in riparian and upslope areas of five forest types in western Oregon. Northwest Science 70(2):109-119.

Grand River Conservation Authority. 2005. Environmental Impact Study Guidelines and Submission Standards for Wetlands. (See section 16 for further detail.)

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Groom, M.J., G.K. Meffe and C.R. Pulliam (eds.). 2005. Principles of Conservation Biology, 3rd edition. Sinauer Associates, Sunderland, Massachusetts.

Harris, L.D. 1984. The Fragmented Forest: Island Biogeographical Theory and the Preservation of Biotic Diversity. University of Chicago Press, Chicago.

Henein, K., and G. Merriam. 1990. The elements of connectivity where corridor quality is variable. Landscape Ecology 4:157-170.

Henshaw, B., and D. Leadbeater. 1999. The Watershed of Farewell Creek: Natural Heritage Features and Restoration Priorities. Prepared for Central Lake Ontario Conservation Authority and the Friends of Second Marsh.

Hess, G.R., and R.A. Fisher. 2001. Communicating clearly about conservation corridors. Landscape and Urban Planning 5:195-208.

Hodges, M.F., and D.G. Krementz. 1996. Neotropical migratory breeding bird communities in riparian forest of different widths along the Altamaha River, Georgia. Wilson Bulletin 108:796-506.

Horton, R.E. 1945. Erosional development of streams and their drainage basins: hydrophysical approach to quantitative morphology. Geological Society of America Bulletin 56:275-370.

Houlahan, J.E., and C.S. Findlay. 2003. The effects of adjacent land use on wetland amphibian species richness and community composition. Canadian Journal of Fisheries and Aquatic Sciences 60:1078-1094. (See section 16 for further detail.)

Houlahan, J.E., and C.S. Findlay. 2004. Estimating the "critical' distance at which adjacent land-use degrades wetland water and sediment quality. Landscape Ecology 19:677-690. (See section 16 for further detail.)

Ilhardt, B.L., E.S. Verry and B.J. Palik. 2000. Defining riparian areas. In R.G. Wagner and J.M. Hagan (eds.). Forestry and the Riparian Zone: Conference Proceedings. University of Maine, Orono, Maine, October 26, 2000. Pp. 7-13. http://www.umaine.edu/fes/Wagner/Publication%20files/ForestryRiparian.PDF#page=16.

Janzen, D.H. 1986. The Eternal External Threatin In M.E. Soule (ed.). Conservation Biology: The Science of Scarcity and Diversity. Sinauer Associates, Sunderland, Massachusetts. Pp. 286-303.

Jones, C., K.M. Somers, B. Craig and T.B. Reynoldson. 2005. Ontario Benthos Biomonitoring Network protocols. http://obbn.eman-rese.ca/PartnerPages/obbn/online_resources.asp.

Jones, M.L., R.G. Randall, D. Hayes, W.I. Dunlop, J. Imhof, G. Lacroix and N. Ward. 1996. Assessing the ecological effects of habitat change: moving beyond productive capacity. Canadian Journal of Fisheries and Aquatic Sciences 53(1):446-457. http://pubs.nrc-cnrc.gc.ca/rp-ps/issueDetail.jsp?jcode=cjfas&lang=eng&vol=53&is=S1.

Joyal, L.A., M. McCollough and M.L. Hunter Jr. 2001. Landscape ecology approaches to wetland species conservation: a case study of two turtle species in southern Maine. Conservation Biology 15(6):1755-1762. (See section 16 for further detail.)

Kays, R.W., and A.A. DeWan. 2004. Ecological impact of inside/outside house cats around a suburban nature preserve. Animal Conservation 7:1-11.

Keller, C.M.E., C.S. Robbins and J.S. Hatfield. 1993. Avian communities in riparian forests of different widths in Maryland and Delaware. Wetlands 13(2):137-144.

Kinley, T.A., and N.J. Newhouse. 1997. Relationship of riparian reserve width zone to bird density and diversity in southwest British Columbia. Northwest Science 71:75-86.

Konze, Karl and McLaren, Margaret. 1997. Wildlife Monitoring Programs and Inventory Techniques for Ontario. Ontario Ministry of Natural Resources. Northeast Science and Technology. Technical Manual TM-009. 139 pp. http://www.mnr.gov.on.ca/en/Business/NESI/Publication/MNR_E001791P.html.

LandOwner Resource Centre and Ontario Ministry of Natural Resources. 2000. Conserving the Forest Interior: A Threatened Wildlife Habitat. Extension Notes. http://www.lrconline.com/Extension_Notes_English/pdf/forInterior.pdf.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources, Southcentral Science Section Field Guide FG-02. Pp. 225.

Lee, M., L. Fahrig, K. Freemark and D.J. Currie. 2002. Importance of patch scale vs landscape scale on selected forest birds. Oikos 96(1):110-118.

Leibowitz, S.G., B. Abbruzzese, P.R. Adamus, L.E. Hughes and J.T. Irish. 1992. A Synoptic Approach to Cumulative Impact Assessment: A Proposed Methodology. U.S. EPA Environmental Research Laboratory, Corvallis, Oregon. Pp. 127.

Lindenmayer, D., R. Cunningham, C. Donnelly and R. Lesslie. 2002. On the use of landscape surrogates as ecological indicators in fragmented forests. Forest Ecology and Management 159:203-216.

Margules, C.R., and R. Pressey. 2000. Systematic conservation planning. Nature 405:243-253.

Marzluff, J.M., and K. Ewing. 2001. Restoration of fragmented landscapes for the conservation of birds: a general framework and specific recommendations for urbanizing landscapes. Restoration Ecology 9:280-292.

Matlack, G.R. 1993. Microenvironment variation within and among forest edge sites in the eastern United States. Biological Conservation 66:185-194.

McPherson, E.G., K.I. Scott and J.R. Simpson. 1998. Estimating cost effectiveness of residential yard trees for improving air quality in Sacramento, California, using existing models. Atmospheric Environment 32(1):75-84.

McPherson, E.G., D. Nowak, G. Heisler, S. Grimmond, C. Souch, R. Grant and R. Rowntree. 1997. Quantifying urban forest structure, function and value: the Chicago urban forest climate project. Urban Ecosystems 1:49-61.

Meffe, G.K., and C.R. Carroll. 1994. Principles of Conservation Biology. Sinauer Associates, Sunderland, Massachusetts. Pp. 673.

Meffe, G.K., and C.R. Carroll. 1997. Principles of Conservation Biology, 2nd edition. Sinauer Associates, Sunderland, Massachusetts. Pp. 729.

Naiman, R.J., H. Decamps and M. Pollock. 1993. The role of riparian corridors in maintaining regional biodiversity. Ecological Applications 3(2):209-12.

North Carolina National Estuarine Research Reserve. 2002. Vegetated Buffers: Improving Environmental Quality in Coastal North Carolina. Technical Paper Series No. 5. http://www.nccoastaltraining.net/uploads/File/ctp/Vegetated%20Buffer%20-%20Technical%20Paper.pdf. (See section 16 for further detail.)

Noss, R.F. 1992. The Wildlands Project: land conservation strategy. Wild Earth (Special Issue):10-24.

Noss, R.F. 1993. Wildlife Corridors. Pp. 43-68 in D.S. Smith and P.C. Hellmund (eds.). Ecology of Greenways. Design and Function of Linear Conservation Areas. University of Minnesota Press, Minneapolis, Minnesota.

Noss, R.F., and A.Y. Cooperrider. 1994. Saving Nature's Legacy: Protecting and Restoring Biodiversity. Island Press, Washington, D.C. Pp. 416.

Noss, R.F., B. Csuti and M.J. Groom. 2006. Habitat Fragmentation. In M.J. Groom, G.K. Meffe and C.R. Carroll (eds.). Principles of Conservation Biology, 3rd edition. Sinauer Associates, Sunderland, Massachusetts. Pp. 779.

Odell, E.A., and R.L. Knight. 2001. Songbird and medium-sized mammal communities associated with exurban development in Pitkin County, Colorado. Conservation Biology 15(4):1143-1150. (See section 16 for further detail.)

Odell, E.A., D.M. Theobald and R.L. Knight. 2003. Incorporating ecology into land use planning: the songbirds' case for clustered development. Journal of the American Planning Association 69(1):72-82. (See section 16 for further detail.)

Oetting, J.B., A.L. Knight and G.R. Knight. 2006. Systematic reserve design as a dynamic process: F-TRAC and the Florida Forever program. Biological Conservation 128:37-46.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Oldham, M.J., W.D. Bakowsky and D.A. Sutherland. 1995. A Floristic Quality Assessment System for Southern Ontario. Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough, Ontario. Pp. 22 + computer disk + app.

Ontario Ministry of Agriculture and Rural Affairs. 2004. Best Management Practices: Buffer Strips.

Ontario Ministry of Municipal Affairs and Housing and Ontario Professional Planners Institute. 2009. Planning by Design: a Healthy Communities Handbook. Queen's Printer for Ontario. http://www.mah.gov.on.ca/Page6737.aspx.

Ontario Ministry of Natural Resources. 1991. A Natural Heritage Framework: A Strategy for the Protection and Management of Natural Heritage in the Greater Toronto Area. November 1991, GTA Branch, Exhibit 150, Tab 7-1.

Ontario Ministry of Natural Resources. 2006. A Proposed Modelling and Scenario-Based Approach for Identifying Natural Heritage Systems in Southern Ontario: Discussion Paper. (unpublished). http://publicdocs.mnr.gov.on.ca/View.asp?Document_ID=11336&Attachment_ID=30215.

Partners in Flight. 2006. Ontario Landbird Conservation Plan: Lower Great Lakes/St. Lawrence Plain (North American Bird Conservation Region 13).

Pearce, C.M. 1992. Pattern analysis of forest cover in southwestern Ontario. East Lakes Geographer 27:65-76.

Peterson, E.B., and N.M. Peterson. 1991. A First Approximation of Principles and Criteria to Make Canada's Protected Areas System Representative of the Nation's Ecological Diversity. Western Ecological Services Limited, Victoria, British Columbia. Report for the Canadian Council on Ecological Areas. Pp. 47 + app.

Phillips, M.E.J. 1996. Natural Heritage Protection in Southern Ontario. Terrestrial Ecosystem Assessment and Management: The Case of Forested Environments. M.Sc. Research Paper. University School of Rural Planning and Development, University of Guelph. Guelph, Ontario. Pp. 77 + app.

Primack, R.B. 1993. Essentials of Conservation Biology. Sinauer Associates, Sunderland, Massachusetts. Pp. 564.

Reynoldson, T.B., W. Keller, K. Somers, G. Watson and C. Brereton. 2003. The development of an invertebrate RCA biomonitoring network for northern Ontario to meet metal-mining EEM requirements. Study design report, March 2003. Acadia University, Laurentian University and INCO Limited.

Riley, J.L., and P. Mohr. 1994. The Natural Heritage of Southern Ontario's Settled Landscapes. A Review of Conservation and Restoration Ecology for Land-Use and Landscape Planning. Ontario Ministry of Natural Resources, Southern Region, Aurora, Ontario, Science and Technology Transfer, Technical Report TR-001. Pp. 78.

Rittenhouse, C.D., W.D. Dijak, F.R. Thompson III and J.J. Millspaugh. 2007. Development of landscape-level habitat suitability models for ten wildlife species in the central hardwoods region. General Technical Report NRS-4. Newtown Square, Pennsylvania. U.S. Department of Agriculture, Forest Service, Northern Research Station. Pp. 47.

Rosenberg, D.K., B.R. Noon and E.C. Meslow. 1997. Biological corridors: form, function and efficacy. Bioscience 47:677-687.

Rosenberg, K.V., J.D. Lowe and A.A. Dhondt. 1999. Effects of forest fragmentation on breeding tanagers: a continental perspective. Conservation Biology 13:568-583.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado. Pp. 370 + app.

Rouge Park Alliance. 2000. Rouge North Management Plan. Provided in six individually numbered sections.

Roulet, N., and B. Freedman. 1999. What trees can do to reduce atmospheric CO2. Tree Canada Foundation. Ottawa, Ontario. http://www.treecanada.ca/publications/pdf/english_reduceco2.pdf.

Rubbo, M.J., and J.M. Kiesecker. 2005. Amphibian breeding distribution in an urbanized landscape. Conservation Biology 19:504-511.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Saunders, D.A., and R.J. Hobbs. 1991. The role of corridors in conservation: what do we know and where do we go? In D.A. Saunders and R.J. Hobbs (eds.). Nature Conservation, 2, the Role of Corridors. Surrey Beatty and Sons, Chipping Norton, NSW. Pp. 421-427.

Sedinger, J.S. 1992. Ecology of prefledging waterfowl. Pp .109-127 in B.D.J. Batt (ed.). Ecology and Management of Breeding Waterfowl. Edited papers presented at the international symposium on the ecology and management of breeding waterfowl, Winnipeg, Manitoba, August 1987. University of Minnesota Press. 635 pp.

Semlitsch, R.D., and J.R. Bodie. 2003. Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles. U.S. Conservation Biology 17(5):1219-1228. (See section 16 for further detail.)

Scott, K.I., E.G. McPherson and J.R. Simpson. 1998. Air pollutant uptake by Sacramento's urban forest. Journal of Arboriculture 24(4):224-234.

Shafer, C.L. 1990. Nature Reserves – Island Theory and Conservation Practice. Smithsonian Institution Press, Washington, D.C. Pp. 189.

Sims, R.A. et al. 1997. Field Guide to the Forest Ecosystem Classification for Northwestern Ontario. NWST Field Guide FG-03. Queen's Printer for Ontario.

Sinclair, K.E., G.R. Hess, C.E. Moorman and J.H. Mason. 2005. Mammalian nest predators respond to greenway width, landscape context and habitat structure. Landscape and Urban Planning 71:277-293. (See section 16 for further detail.)

Smith, P.G.R., and J.A. Theberge. 1986. A review of criteria for evaluating natural areas. Environmental Management 10:715-734.

Smith, R.J., and J.M. Schaefer. 1991. Avian characteristics of an urban riparian strip corridor. Wilson Bulletin. 104(4):732-738.

Spackman, S.C., and J.W. Hughes. 1995. Assessment of minimum stream corridor width for biological conservation: species richness and distribution along mid-order streams in Vermont, USW. Biological Conservation 71:325-332.

Speirs, J.M. 1985. Birds of Ontario. Volume 2. Natural Heritage/Natural History Inc., Toronto, Ontario.

Stammler, K.L., R.L. McLaughlin and N.E. Mandrak. 2008. Streams modified for drainage provide fish habitat in agricultural areas. Canadian Journal of Fisheries and Aquatic Sciences 65(3):509-522.

Stanfield, L. (ed.). 2005. Ontario Stream Assessment Protocol, Version 7. Fish and Wildlife Branch. Ontario Ministry of Natural Resources. Peterborough, Ontario. Pp. 256. http://www.mnr.gov.on.ca/226871.pdf.

Steedman, R.J. 1988. Modification and assessment of an index of biotic integrity to quantify stream quality in southern Ontario. Canadian Journal of Fisheries and Aquatic Sciences 45:492-501.

Strahler, A.N. 1957. Quantitative analysis of watershed geomorphology. American Geophysical Union Transactions 38:913-920.

Taylor, K.C., R.W. Arnup, B.G Merchant, W.J. Parton and J. Nieppola. 2000. A Field Guide to Forest Ecosystems of Northeastern Ontario, 2nd edition. NEST Field Guide FG-001. Queen's Printer for Ontario.

Theobald, D.M., J.R. Miller and N.T Hobbs. 1997. Estimating the cumulative effects of development on wildlife habitat. Landscape and Urban Planning 39:25-36. (See section 16 for further detail.)

Tiebout, H.M. III, and R.A. Anderson. 1997. A comparison of corridors and intrinsic connectivity to promote dispersal in transient successional landscapes. Conservation Biology 11:620-627.

Tischendorf, L., and C. Wissel. 1997. Corridors as conduits for small animals: attainable distances depending on movement pattern, boundary reaction and corridor width. Oikos 79(3):603-611.

Toronto and Region Conservation Authority. 2004. Toronto and Region Terrestrial Natural Heritage Strategy. Draft. Pp. 55 + maps.

Toronto and Region Conservation Authority. 2007. The Natural Functions of Headwater Drainage Features: A Literature Review.

Troy, A. and K. Bagstad. 2009. Estimating Ecosystem Services in Southern Ontario. Spatial Informatics Group.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Trzcinski, M.K., L. Fahrig and G. Merriam. 1999. Independent effects of forest cover and fragmentation on the distribution of forest breeding birds. Ecological Applications 9:586-593.

United Nations. 1993. United Nations Convention on Biological Diversity.

Upper Thames River Conservation Authority (UTRCA). 2003. The Middlesex Natural Heritage Study: a natural heritage study to identify significant woodland patches in Middlesex County. http://www.thamesriver.on.ca/MNHS/MNHS.htm.

Vora, R.S. 1994. Integrating old-growth forest into managed landscapes – a northern Great Lakes perspective. Natural Areas Journal 14(2):113-123.

Warman, L.D., D.M. Forsyth, A.R.E. Sinclair, K. Freemark, H.D. Moore, T.W. Barrett, R.L. Pressey and D. White. 2004. Species distributions, surrogacy and important conservation regions in Canada. Ecology Letters 7(5):374-379.

Weathers, K.C., M.L. Cadenasso and S.T.A. Pickett. 2001. Forest edges as nutrient and pollutant concentrators: potential synergisms between fragmentation, forest canopies and the atmosphere. Conservation Biology 15(6):1506-1514.

Weldon, A.J. 2006. How corridors reduce Indigo Bunting nest success. Conservation Biology 20:1300-1305.

Wenger, Seth. 1999. A Review of the Scientific Literature on Riparian Buffer Width, Extent and Vegetation. Office of Public Service and Outreach, Institute of Ecology, University of Georgia. (See section 16 for further detail.)

Whitford, W.G., and A. Vinegar. 1966. Homing, survivorship and overwintering of larvae in spotted salamanders, Ambystoma maculatum. Copeia 1966:515-519.

Wilderness Society. 2004. Landscape Connectivity: An Essential Element of Land Management. Ecology and Economics Research Department.

Wilhelm, G., and D. Ladd. 1988. Natural Area Assessment in the Chicago Region. 53rd Transactions of North American Wildlife and Natural Resources Conference. Pp. 361-375.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

ADDITIONAL READING

This list of additional reading is provided to highlight historical documents, local information sources and other supplementary technical information that may be useful in understanding natural heritage.

Adams, L.W., and L.E. Dove. 1989. Wildlife Reserves and Corridors in the Urban Environment. A Guide to Ecological Landscape Planning and Resource Conservation. National Institute for Urban Wildlife, Columbia, Maryland.

American Water Resources Association. 1978. Wetland Functions and Values: The State of Our Understanding. University Microfilms International, Ann Arbor, Michigan.

Andren, H. 1994. Effects of habitat fragmentation on birds and mammals in landscapes with different proportions of suitable habitat: a review. Oikos 71:355-366.

Argus, G.W., and K.M. Pryer. 1990. Rare Vascular Plants in Canada: Our Natural Heritage. Canadian Museum of Nature, Ottawa, Ontario.

Bakowsky, W.D. 1995. S-Ranks for Southern Ontario Vegetation Communities. Draft. Ontario Ministry of Natural Resources. Natural Heritage Information Centre, Peterborough, Ontario. Pp. 11.

Bardecki, M.J., and N. Patterson (eds.). 1988. Wetlands: Inertia or Momentum. Conference proceedings. Toronto, Ontario, October 21-22, 1988. Federation of Ontario Naturalists, Don Mills, Ontario.

Beanlands, G.E., and P.N. Duinker. 1983. An Ecological Framework for Environmental Impact Assessment in Canada. Institute for Resource and Environmental Studies, Dalhousie University, Published in Cooperation with Federal Environmental Assessment Review Office.

Beanlands, G.E., W.J. Erckmann, G.H. Orians, J. O'Riordan, D. Policansky, M.H. Sadar and B. Sadar (eds.). 1986. Proceedings of the Workshop on Cumulative Environmental Effects: A Binational Perspective. Canadian Environmental Assessment Research Council and the United States National Research Council. Minister of Supply and Services Canada. Pp. 175.

Beechey, T.J. 1980. A Framework for the Conservation of Ontario's Biological Heritage. Parks and Recreational Areas Branch. Ontario Ministry of Natural Resources, Peterborough, Ontario.

Beechey, T.J. 1989. Guidelines for the Selection of Protected Ecological Areas. Canadian Council on Ecological Areas Occasional Paper No. 5. Pp. 40.

Ben, C. 1995. Performance Measurement for Planning in Ontario: Office of the Provincial Facilitator, Ontario Ministry of Municipal Affairs and Housing, Toronto.

Boyle, M., and J.J. Kay. 1996. Supplementary Appendices to State of the Landscape Reporting: A Background Literature Review and Database on Monitoring and Indicators. Prepared for the Ontario Ministry of Natural Resources.

Boyle, M., J.J. Kay and B. Pond. 1996. State of the Landscape Reporting: The Development of Indicators for the Provincial Statement Under the Planning Act. Prepared for the Ontario Ministry of Natural Resources.

Boysen, E. 1994. Growth and Yield Masterplan for the Southern Region. Rep. TR-003. Scientific Technical Transfer Unit, Southern Region, Ontario. Ontario Ministry of Natural Resources. Pp. 127.

Brinson, M.M. 1988. Strategies for assessing the cumulative effects of wetland alteration on water quality. Environmental Management 12:655-662.

Broadfoot, J.D., T.J. Bellhouse and B.J. Naylor. 1994. Central Region White-tailed Deer Habitat Supply Model: Background, Algorithm and Functional Relations. Ontario Ministry of Natural Resources, Central Region Science and Technology Technical Report No. 36. Pp. 85.

Broadfoot, J.D., T.J. Bellhouse and B.J. Naylor. 1995. A Test of the Central Region White-tailed Deer Habitat Supply Model.Ontario Ministry of Natural Resources, Central Region Science and Technology Technical Report No. 42. Pp. 16.

Quick Links
Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Brownell, V.R., and C.S. Blaney. 1996. Lower Trent Region Natural Areas – Volume 3. A Biological Inventory and Evaluation of 23 Natural Areas in the Lower Trent Region. 1995. Prepared for the Lower Trent Region Conservation Authority, Trenton, Ontario. Pp. 156 + 23 maps at 1:10,000.

Brownell, V.R., and B.H. Larson. 1995. An Evaluation Framework for Natural Areas in the Regional Municipality of Ottawa-Carleton. Two volumes. Prepared for the Regional Municipality of Ottawa-Carleton, Planning and Property Services Department, Ottawa. Volume 1. Pp. 120. Volume 2 – Technical Appendices. Pp. 92.

Buckley, P.A., and F.G. Buckley. 1976. Guidelines for the Protection and Management of Colonially Nesting Waterbirds. North Atlantic Regional Office, National Parks Service, Boston, Massachusetts.

Burke, P. 1999. A Natural History of Peterborough County.

Campbell, C.A., and L.E. Lamb. 1984. A Preliminary Flora of the Regional Municipality of Waterloo, Ontario.

Catling, P.M., and V.R. Brownell. 1995. A review of the alvars of the Great Lakes Region: distribution, floristic composition, biogeography and protection. Canadian Field-Naturalist 109(2):143-171.

Childers, D., and J.G. Gosselink. 1990. Assessment of cumulative impacts to water quality in a forested wetland landscape. Journal of Environmental Quality 19:455-464.

Coker, G.A, C.B. Portt and C.K. Minns. 2001. Morphological and ecological characteristics of Canadian freshwater fishes. Canadian Manuscript Report of Fisheries and Aquatic Sciences. 2554. Pp. iv + 89. http://epe.lac-bac.gc.ca/100/200/301/dfo-po/cdn_manuscript_report/no2554/mr2554.pdf.

Cooperrider, A.Y., R.J. Boyd and H.R. Stuart (eds.). 1986. Inventory and Monitoring of Wildlife Habitat. USDI Bureau of Land Management Service Center, Denver, Colorado.

Couturier, A. 1999. Conservation priorities for the birds of southern Ontario. Internal report. Bird Studies Canada, Port Rowan, Ontario.

Crins, W.J. 1999. Vascular Plants of the Regional Municipality of Halton, Ontario.

Cronquist, M., and R.P. Brooks. 1991. Use of avian and mammalian guilds as indicators of cumulative impacts in riparian-wetland areas. Environmental Management 15:701-714.

Cuddy, D.G. 1991. Vascular Plants of Eastern Ontario, Draft 2.0. Ontario Ministry of Natural Resources, Kemptville, Ontario.

Damschen, E.I., N.M. Haddad, J.L. Orrock, J.J. Tewksberry and D.J. Levey. 2006. Corridors increase plant species richness at large scales. Science 313:1284-1286.

Dillon Consulting Limited. 2003. City of Pickering Growth Management Study, Phase 1: Natural Heritage (Appendix B). Report produced for the City of Pickering. Pp. 55 + maps.

Dougan & Associates. 2003. Natural Areas Inventory: Town of Fort Erie Settlement Areas (2 Volumes), final Draft. Prepared for the Town of Fort Erie Community Planning & Development Services, March 2003.

Dougan & Associates. 2005. Region of Waterloo Environmentally Sensitive Landscapes (ESLs) Study: Discussion Paper. Final Report submitted to the Region of Waterloo Planning Department August 2005. Pp. 60 + app.

Dougan & Associates and Ecological Outlook. 2005. City of Guelph Natural Heritage Strategy, Phase 1: Terrestrial Inventory Design & Defining Locally Significant Natural Areas, Final Report. Prepared for the City of Guelph, March 2005. Pp. 112 + maps.

Dunn, E.H., D.J.T. Hussell and J. Siderius. 1985. Status of the Great Blue Heron, Ardea herodias, in Ontario. Canadian Field Naturalist 99:62-70.

Ecologistics Limited et al. 1994. A Cumulative Environmental and Monitoring Framework for the Oak Ridges Moraine Area: Background Report 13 and 14 to the Oak Ridges Moraine Planning Study. Prepared for the Oak Ridges Moraine Technical Working Committee.

Environment Canada. 1996. Measuring Up: A Resource Guide for Municipal State of the Environment Reporting. Occasional Paper No 7. State of the Environment Directorate, Environment Canada, Ottawa, Ontario.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

ESG International Inc. 1999. Greenlands: A Natural Heritage System for the Township of King. Report prepared for Township of King and the Regional Municipality of York. Pp. 71 + app. + maps.

Evans, K.E., and R.N. Conner. 1979. Snag management. Pp. 214-225 in R.M. DeGraaf and K.E. Evans (eds.). Management of North Central and Northeastern Forests for Nongame Birds. USDA Forest Service General Technical Report. NC-51.

Fahrig, L., and G. Merriam. 1985. Habitat patch connectivity and population survival. Ecology 66:1762-1768.

Fahrig, L. and G. Merriam. 1994. Conservation of fragmented populations. Conservation Biology 8:50-59.

Fahrig, L., and J. Palobeimo. 1988. Effect of spatial arrangement of habitat patches on local population size. Ecology 69:468-475.

Freemark, K., and B. Collins. 1992. Landscape ecology of birds breeding in temperate forest fragments. Pp. 443-454 in J.M. Hagan and D.W. Johnston (eds.). Ecological and Conservation of Neotropical Landbirds. Smithsonian Institution Press. Washington, D.C.. Pp. 609.

Gartner Lee Ltd. 1992. A Resource Inventory and Development Suitability Assessment of the City of Vaughan.

Gartner Lee Ltd. 1993. Developing a Greenlands Strategy for the Regional Municipality of York: A Background Report in Support of York Region's Official Plan.

Gartner Lee Ltd. 1994. A Greenlands System for York Region. Final Report. Report prepared for the Regional Municipality of York Planning Department. Pp. 67 + maps.

Gartner Lee Ltd. 1996. Development of a Natural Heritage System for the County of Simcoe. Report prepared for the County of Simcoe. Pp. 62.

Gartner Lee Ltd. 2000. Whitchurch-Stouffville Natural Features and Greenlands Study. Report prepared for the Town of Whitchurch-Stouffville. Pp. 74 + app.

Geomatics International Inc. 1993. Natural Heritage System for the Oak Ridges Moraine Area GTA Portion. Background Study No. 4 to the Oak Ridges Moraine Planning Study.

Geomatics International Inc. 1997a. Natural Heritage System for the St. Clair River Watershed. Final Draft. Report prepared for St. Clair River Remedial Action Plan, Ontario Ministry of Environment and Energy, Sarnia, Ontario. Pp. 35 + maps.

Geomatics International Inc. 1997b. Rouge-Duffins Draft Natural Heritage System. Report prepared for the Ontario Ministry of Natural Resources, Aurora, Ontario. Pp. 53 + map.

Geomatics International Inc. 1997c. The Ontario Niagara Escarpment Monitoring Program Terrestrial Ecology Monitoring: Phase III of the Niagara Escarpment Cumulative Effects Monitoring Projects. Prepared for the Ontario Ministry of Environment and Energy, Environmental and Analysis Branch, Toronto.

Geomatics International Inc. 1998. Richmond Hill Corridor Study. Final Draft Report. Report prepared for the Town of Richmond Hill Planning and Development Department. Pp. 159 + map. (*Note:* An addendum was provided to this report in February 1999.)

Geomatics International Inc. 1999. Georgian Bay Greater Ecosystem Bioregional Study. Report prepared for Georgian Bay Islands National Park. Pp. 52.

Gore & Storrie Ltd. in association with Hough Stansbury Woodland Ltd. 1992. Plan for Markham's Environment.

Graham, K., B. Collier, M. Bradstreet and B. Collins. 1996. Great Blue Heron (Ardea herodias) populations in Ontario: data from and insights on the use of volunteers. Colonial Waterbirds 19(1):39-44.

Graves, B.M., and S.H. Anderson. 1987. Habitat Suitability Index Models: Bullfrog. Biological Report 82(10.138). National Ecology Center, Fish and Wildlife Service, U.S. Dept. of Interior, Washington, D.C. Pp. 23.

Great Lakes Commission. 2003. The Great Lakes Coastal Wetland Inventory. http://www.glc.org/wetlands.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Halton Region and North-South Environmental Inc. 2005. Halton Region Environmentally Sensitive Areas Consolidation Report. Unpublished report prepared by Halton Region Planning and Public Works Department in conjunction with North-South Environmental Inc. Pp. 222 + app.

Hamilton-Wentworth Planning and Development Department. 1994. Towards a Regional Greenlands System – Discussion Paper.

Henson, B.L., K.E. Brodribb and J.L. Riley. 2005. Great Lakes Conservation Blueprint for Terrestrial Biodiversity, Volume 1. Nature Conservancy of Canada, Toronto, Ontario. Pp. x + 157.

Hills, G.A. 1959. A Ready Reference to the Description of the Land of Ontario and Its Productivity. Preliminary report. Ontario Department of Lands and Forests, Division of Research Maple, Ontario.

Hounsell, S. 1994. Defining Woodland Significance Using GIS. Pp. 35-40 in S. Strobl (ed.). Significant Woodlands Workshop Proceedings, WP-003. November 22-23, 1993, Dorset, Ontario.

Hounsell, S.W. 1989. Methods for Assessing the Sensitivity of Forest Birds and Their Habitats to Transmission Line Disturbances. Land Use and Environmental Planning Department, Stations and Transmission Programs Group, Ontario Hydro, Toronto. Pp. 616.

Imhof, J.G., J. Fitzgibbon and W.B. Annable. 1996. A hierarchical evaluation system for characterizing watershed ecosystems for fish habitat. Canadian Journal of Fisheries and Aquatic Sciences 53(Suppl. 1):312-326.

Jalava, J.V. 2000. The Big Picture Project: Developing a natural heritage vision for Canada's southernmost ecological region. Natural Heritage Information Centre Newsletter 6(1):1-6.

Jalava, J.V., J.L. Riley, A.E. Zammit, P.J. Sorrill, T. Holden and J. Henson. 2002. Big picture applications of bioregional planning in Ontario. In J. Porter and J.G. Nelson with D. Bazely, T. Beechey, W.R. Stephenson, J. Marsh and T. Nudds (eds.). Parks and Protected Areas Research in Ontario 2001. Pp. 25-35.

James, R.D. 1984a. Habitat Management Guidelines for Cavity-nesting Birds in Ontario. Prepared for Non-game Program, Wildlife Branch, Ontario Ministry of Natural Resources, Toronto.

James, R.D. 1984b. Habitat Management Guidelines for Ontario's Forest Nesting Accipiters, Buteos and Eagles. Prepared for Non-game Program, Wildlife Branch, Ontario Ministry of Natural Resources, Toronto.

James, R.D. 1984c. Habitat Management Guidelines for Warblers of Ontario's Northern Coniferous Forests, Mixed Forests or Southern Hardwood Forests. Prepared for Non-game Program, Wildlife Branch, Ontario Ministry of Natural Resources, Toronto.

Kaiser, J. 2001. The Vascular Plant Flora of the Region of Peel and the Credit River Watershed

Kent, D.M. (ed.). 1994. Applied Wetlands Science and Technology. CRC Press Inc. Pp. 436.

Kilgour, B.W., and D.R. Barton. 1999. Associations between stream fish and benthos across environmental gradients in southern Ontario, Canada. Freshwater Biology 41(3):553-566. http://www3.interscience.wiley.com/journal/119081255/abstract.

Lee, L.C., and J.G. Gosselink. 1988. Cumulative impacts on wetlands: linking scientific assessments and regulatory alternatives. Environmental Management 12:591-602.

Levenson, J.P. 1976. Forested Woodlots as Biogeographic Islands in an Urban-Agricultural Matrix. Ph.D. dissertation, University of Wisconsin-Milwaukee. Cited in Dorney, J.R. and L.A. Leitner. 1985. Woodlot scale: a method for rapid assessment of woodlot values. Environmental Management 9(1):27-34.

LGL Ltd. and Keir Consultants Inc. 1996. Town of Georgina Natural Features and Greenlands System. Report prepared for the Town of Georgina Development Services Department. Pp. 127.

Maclaren, V.W., et al. 1995. Developing Indicators of Urban Sustainability: The Canadian Experience – Interim Report. Prepared for State of Environment Directorate, Environment Canada, Canada Mortgage and Housing Corporation and the Intergovernmental Committee on Urban and Regional Research.

Magette, W.L., R.B. Brinsfield, R.E. Palmer and J.D. Wood. 1989. Nutrient and sediment removal by vegetated filter strips. Transactions of the American Society of Agricultural Engineers 32(2):663-667.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Middleton, J., and M. Gray. 1983. Distribution of woodland species in farmland woods. Journal of Applied Ecology 20:625-644.

Mulamoottil, G.A., B.G. Warner and E.A McBean (eds.). 1996. Wetlands – Environmental Gradients, Boundaries, and Buffers. CRC Press Inc. Pp. 298.

NCASI. 1996. The National Gap Analysis Program: Ecological Assumptions and Sensitivity to Uncertainty. National Council of the Paper Industry for Air and Stream Improvement, Inc. Technical Bulletin No. 720. North Carolina.

Naylor, B., A. Todd and S. Christilaw. 1994. A Non-spatial Habitat Suitability Index Model for Red-shouldered Hawks in the Great Lakes-St. Lawrence Forest Region of Ontario. Ontario Ministry of Natural Resources. CRST Technical Report 38. Pp. 8.

Norfolk Field Naturalists. 1987. The Natural Areas Inventory of the Regional Municipality of Haldimand-Norfolk, Vol II. Annotated checklists.

Norman, A.J. 1994. Recommendations on the Use of Vegetative Buffer Strips to Protect Wetlands in Southern Ontario. Proceedings of a Wetland Symposium on Boundaries, Buffers and Environmental Gradients. Niagara Falls, Ontario, April 1994.

North-South Environmental Inc. 2003. A Natural Heritage System for the Rouge River, North Leslie Secondary Plan Area. Draft. Report prepared for The Town of Richmond Hill, The Regional Municipality of York and the Toronto and Region Conservation Authority. Pp. 8 + maps.

North-South Environmental Inc. 2006. A Natural Heritage Evaluation for the North-East Aurora Planning Area "2C." Report prepared for the Town of Aurora. Pp. 86.

Noss, R.F. 1990. Indicators for monitoring biodiversity: a hierarchical approach. Conservation Biology 4(4):355-364.

Noss, R.F. 1995. Maintaining Ecological Integrity in Representative Reserve Networks. Discussion Paper. World Wildlife Fund Canada, Toronto, Ontario.

Obbard, M. 1996. Black Bear. Presentation at the Significant Wildlife Habitat Workshop, January 17-18, 1996. Peterborough, Ontario. Written copy and video on file at Ontario Ministry of Natural Resources, Kemptville, Ontario.

Oldham, M.J. 1993. Distribution and Status of the Vascular Plants of Southwestern Ontario. Ontario Ministry of Natural Resources, Aylmer, Ontario.

Oldham, M.J. 1994a. Natural Heritage Resources of Ontario: Amphibians. Natural Heritage Information Centre, Peterborough, Ontario. Pp. 10.

Oldham, M.J. 1994b. Natural Heritage Resources of Ontario: Mosses. Draft. Natural Heritage Information Centre, Peterborough, Ontario. Pp. 22.

Oldham, M.J. 1994c. Natural Heritage Resources of Ontario: Rare Vascular Plants. Natural Heritage Information Centre, Peterborough, Ontario. Pp. 22.

Oldham, M.J. 1994d. Natural Heritage Resources of Ontario: Reptiles. Natural Heritage Information Centre, Peterborough, Ontario. Pp. 10.

Oldham, M.J. 1996. Natural Heritage Resources of Ontario: Amphibians and Reptiles. Natural Heritage Information Centre, Peterborough, Ontario. Pp. 22.

Oldham, M.J. 1999. Checklist of the Vascular Plants of Peterborough County.

Oldham, M.J., and D.A. Sutherland. 1986. 1984 Ontario Herpetofaunal Summary. Essex Region Conservation Authority and World Wildlife Fund Canada, Toronto, Ontario. Pp. 214.

Ontario Ministry of Environment and Energy and Ontario Ministry of Natural Resources. 1993a. Integrating Water Management Objectives into Municipal Planning Documents. Pp. 12.

Ontario Ministry of Environment and Energy and Ontario Ministry of Natural Resources. 1993b. Subwatershed Planning. Pp. 38.

Ontario Ministry of Environment and Energy and Ontario Ministry of Natural Resources. 1993c. Water Management on a Watershed Basis: Implementing an Ecosystem Approach. Pp. 32.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Ontario Ministry of Municipal Affairs and Housing. 1997. Performance Indicators: Background Material. Planning Policy Branch, Ontario Ministry of Municipal Affairs and Housing, Toronto.

Ontario Ministry of Natural Resources. 1987. Guidelines on the Use of "Vegetative Buffer Zones" to Protect Fish Habitat in an Urban Environment. Central Region, September 1987.

Ontario Ministry of Natural Resources. 1990. The Moose in Ontario. Book 1 – Moose Biology, Ecology and Management Chapters 1 to 7. Publications Ontario, Toronto.

Ontario Ministry of Natural Resources. 1996a. State of the Landscape Reporting: The Development of Indicators for the Provincial Policy Statement Under the Planning Act.

Ontario Ministry of Natural Resources. 1996b. Supplementary Appendices to State of the Landscape Reporting. A Background Literature Review and Database on Monitoring and Indicators.

Ontario Ministry of Natural Resources and Ontario Ministry of Environment and Energy. 1997a. An Evaluation of Watershed Management in Ontario. Final Report.

Ontario Ministry of Natural Resources and Ontario Ministry of Environment and Energy. 1997b. Inventory of Watershed Management Projects in Ontario. 1990-1995.

Ontario Ministry of Natural Resources and Ontario Ministry of Environment and Energy. 1997c. Watershed Action Guide. Draft.

Ontario Nature. 2004. Southern Ontario Greenway Strategy: a cooperative approach to protect natural cores and corridors. http://www.ontarionature.org/enviroandcons/greenway/index.html.

Phair, C., B.L. Henson and K.E. Brodribb. 2005. Volume 2. Tertiary Watershed Summaries. Nature Conservancy of Canada, Toronto, Ontario. Pp. ii + 452.

Phillips, M.J. 1996. Natural Heritage Protection in Southern Ontario – Terrestrial Ecosystem Assessment and Management: The Case of Forested Environments. M.Sc. Thesis. University of Guelph, Ontario.

Reid, D. 1996. Wild Turkey. Presentation at the Significant Wildlife Habitat Workshop, January 17-18, 1996. Peterborough, Ontario. Written copy and video on file at Ontario Ministry of Natural Resources, Kemptville.

Riley, J.L. 1989. Distribution and Status of the Vascular Plants of Central Region. Ontario Ministry of Natural Resources, Parks and Recreational Areas Section, Central Region, Richmond Hill, Ontario.

Riley, J.L. 2003. Flora of the Hudson Bay Lowland and Its Postglacial Origins. National Research Council of Canada Press, Ottawa. Pp. viii + 236.

Riley, J.L., J.V. Jalava and S. Varga. 1996. Ecological survey of the Niagara Escarpment Biosphere Reserve. Volume I. Significant Natural Areas. Volume II. Technical Appendices. Ontario Ministry of Natural Resources, Southcentral Region, Peterborough, Ontario. Open file Site Report SR 9601. Pp. v + 629, Pp. vii + 310.

Ryder, R.A., and C.J. Edwards (eds.). 1985. A Conceptual Approach for the Application of Biological Indicators of Ecosystem Quality in the Great Lakes Basin. A joint effort of the International Joint Commission and the Great Lakes Fishery Commission. Pp. 169.

Schroeder, R.L., and L. Haire. 1993. Guidelines for the Development of Community Level Habitat Evaluation Models. Biological Report 8, U.S. Fish and Wildlife Service, Colorado.

Schueler, F. 1995. Spatial and Temporal Distribution of Herpetological Records from the Lake Ontario Waterfront. Prepared for the Waterfront Regeneration Trust, Toronto, Ontario. Unpublished manuscript.

Smith, P.G.R., and J.A. Theberge. 1987. Evaluating natural areas using multiple criteria: theory and practice. Environmental Management 11(4):447-460.

Snell, E.A. 1987. Wetland Distribution and Conversion in Southern Ontario. Inland Waters/Lands Directorate. Environment Canada. Working Paper 48. Ottawa, Ontario.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Sonntage, N.C., R.R. Everitt, L.P. Rattie, D.L. Colnett, C.P. Wolf, J.C. Truett, A.H.J. Dorcey and C.S. Holling. 1987. Cumulative Effects Assessment: A Context for Further Research and Development. A Background Paper Prepared for the Canadian Environmental Assessment Research Council.

Stanfield, L., M. Jones, M. Stoneman, B. Kilgour, J. Parish and G. Wichert. 1997. Stream Assessment Protocol for Ontario. Ontario Ministry of Natural Resources, Fish and Wildlife Branch, Peterborough, Ontario.

Stauffer, D.F., and L.B. Best. 1980. Habitat selection by birds of riparian communities: evaluating effects of habitat alterations. Journal of Wildlife Management 44:1-15.

Sutherland, D.A. 1994a. Natural Heritage Resources of Ontario: Birds. Natural Heritage Information Centre, Peterborough, Ontario. Pp. 22.

Sutherland, D.A. 1994b. Natural Heritage Resources of Ontario: Butterflies. Draft. Natural Heritage Information Centre, Peterborough, Ontario. Pp. 12.

Sutherland, D.A. 1994c. Natural Heritage Resources of Ontario: Freshwater Fishes. Draft. Natural Heritage Information Centre, Peterborough, Ontario. Pp. 12.

Sutherland, D.A. 1994d. Natural Heritage Resources of Ontario: Mammals. Draft. Natural Heritage Information Centre, Peterborough, Ontario. Pp. 9.

Thunder Bay Field Naturalists. 1998. Checklist of Vascular Plants of Thunder Bay District.

Varga, S., and G.M. Allen. 1990. County/Regional Municipality Vascular Plant Floras for the Carolinian Zone of Canada. In G.M. Allen, P.F.J. Eagles and S.D. Price (eds.). Conserving Carolinian Canada – Conservation Biology in the Deciduous Forest Region. University of Waterloo Press, Waterloo, Ontario. Pp. 129-153.

Verner, J.M. Morrison, and C.J. Ralph (eds.). 1986. Wildlife 2000: Modeling Habitat Relationships of Terrestrial Vertebrates. University of Wisconsin Press.

VHB Research & Consulting Inc. LocPlan and Lawrence MacDonald & Associates. 1990. Evaluation Methods in Environmental Assessment. Prepared for Ontario Ministry of the Environment. Queen's Printer for Ontario.

Voigt, D.R. 1992. White-tailed Deer Habitat in Ontario: Background to Guidelines. Ontario Ministry of Natural Resources, Fish and Wildlife Branch, Peterborough, Ontario. Pp. 35.

Weaver, M., and M. Kellman. 1981. The effects of forest fragmentation on woodlot tree biotas in southern Ontario. Journal of Biogeography 8:199-210.

Wilcove, D.S. 1985. Nest predation in forest tracts and the decline of migratory songbirds. Ecology 66:1211-1214.

Wilcove, D.S., and S.K. Robinson. 1990. The Impact of Forest Fragmentation on Bird Communities in Eastern North America. Pp. 319-331 in A. Keast (ed.). Biogeography and Ecology of Forest Bird Communities. SPB Publishing, The Hague, Netherlands.

Woodard, S.E., and C.A. Rock. 1991. The Role of Natural Buffer Strips in Controlling Phosphorus and Sediment Runoff. Water Pollution Control Federation 64th Annual Conference and Exposition, Toronto, Ontario, October 7-10, 1991.

World Wildlife Fund. 1995. A Protected Areas Gap Analysis Methodology: Planning for the Conservation of Biodiversity. World Wildlife Fund Canada, Toronto, Ontario.

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219

Quick Links

Table of Contents ii
Abbreviations Used in This Manual xi
Provincial Policy Statement Implementation 6
Natural Heritage Systems 15
Natural Heritage Features and Areas 37
Significant Habitat of Endangered and Threatened Species 47
Significant Wetlands and Significant Coastal Wetlands 56
Significant Woodlands 63
Significant Valleylands 74
Significant Wildlife Habitat 81
Significant Areas of Natural and Scientific Interest 90
Fish Habitat 94
How to Protect: Municipal Planning Techniques and Tools 107
Addressing Impacts of Development and Site Alteration 118
Provincial Land Use Planning Documents 134
Natural Heritage System Planning 145
Natural Heritage Information Sources 166
Glossary 216
Works Cited 219